SECTION 3

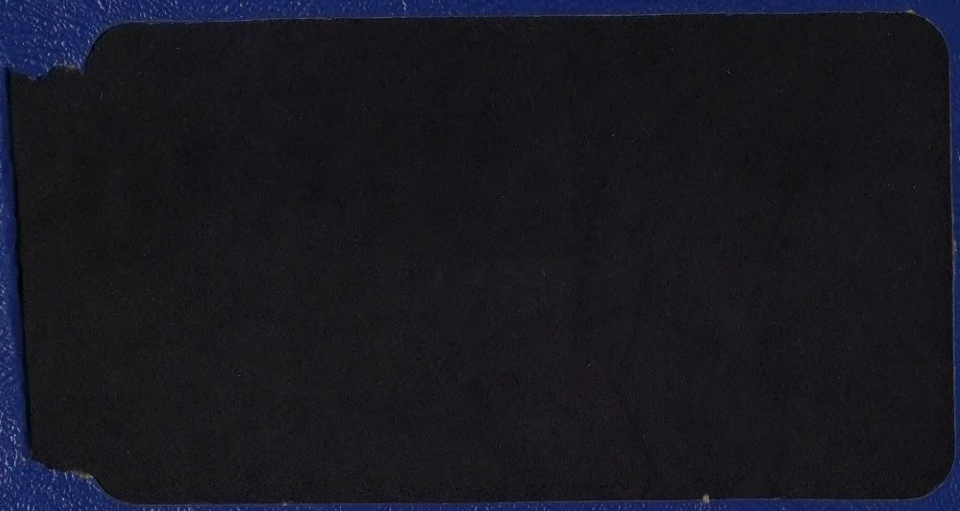
MODEL 5608

MARKER BEACON RECEIVER

34-8

Maintenance and Overhaul

Lear



— SECTION 8 —

MODEL 5608

MARKER BEACON RECEIVER 34-8

CHAPTER 34 — LNC-200 NAVIGATION SYSTEM

SUBJECTS —

0 INTRODUCTION

1 DESCRIPTION AND OPERATION

2 TROUBLE SHOOTING

3 MAINTENANCE PRACTICES

4 ILLUSTRATED PARTS BREAKDOWN

Lear

RECORD OF REVISIONS

LOCATION

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REV. NO.	INSERTION DATE	BY	REV. NO.	INSERTION DATE	BY	REV. NO.	INSERTION DATE	BY	REV. NO.	INSERTION DATE	BY

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MODEL 5608 MARKER BEACON RECEIVER

MAINTENANCE AND OVERHAUL MANUAL

INTRODUCTION

1. This section contains maintenance and overhaul instructions for the Model 5608 Marker Beacon Receiver.

2. The Model 5608 Marker Beacon Receiver can be utilized as an independent unit for the reception of marker beacon transmissions or as a supplementary module in the comprehensive LNC-200 radio navigation system. In the system configuration the aural output of the marker beacon receiver is further amplified in the Model 5522 Isolation Amplifier and applied to the cockpit speaker. When operated as an independent unit, the audio output of the marker beacon receiver is applied directly to a 500-ohm headset, or to a separate audio power amplifier for reproduction in a loudspeaker. The visual indications provided by the receiver are the same in both modes of operation, and consist of three colored lamps that respond selectively to the 400, 1300, and 3000-cps modulation components of the marker beacon transmissions.

3. This section is divided into four subjects which are entitled respectively, Description, Troubleshooting, Maintenance Practices, and Illustrated Parts Breakdown. The four subjects provide sufficent information to enable a technician to understand the operating principles of the equipment, and to perform alignment, minimum performance, and troubleshooting test procedures.

MODEL 5608 MARKER BEACON RECEIVER

DESCRIPTION AND OPERATION

1. Physical Description

A. The Model 5608 Marker Beacon Receiver is a plug-in module. (See figure 1.)

B. The dimensions of the receiver are 7 1/4 inches by 4 1/2 inches by 3 inches.

C. The receiver assembly contains vacuum tubes, germanium transistors, thermistors, transformers, fixed capacitors and resistors. These parts are integral to an etched circuit board which is mounted on a chassis frame and enclosed by a perforated cover. The electrical connector forms an extension of the circuit board and inserts into the shockmount on which the module is mounted. The module is locked into the shockmount by a captive screw.

D. The Model 5608 marker beacon receiver is available in three different versions for which the current model numbers are given below:

(1) Model 5608A: Operates from a 14- or 28-vdc primary source. Requires a separate 125-vdc B-plus supply. This model is normally used with the LNC-200 radio navigation system.

(2) Model 5608B: Operates from a 14-vdc supply. Includes the Model 2354A transistorized plug-in power supply for the B-plus requirements.

(3) Model 5608C: Operates from a 28-vdc primary supply. Includes the Model 2354B transistorized plug-in power supply for the B-plus requirements.

E. A complete marker beacon receiver installation includes the following items: (See Figure 2)

(1) Model 5608A, -B, or -C, marker beacon receiver.

(2) Model 2354A or -B, plug-in power supply. (With models 5608B and C receivers only).

(3) An Indicator Light Kit. (Part numbers 714204-101, -102, -201, or -202).

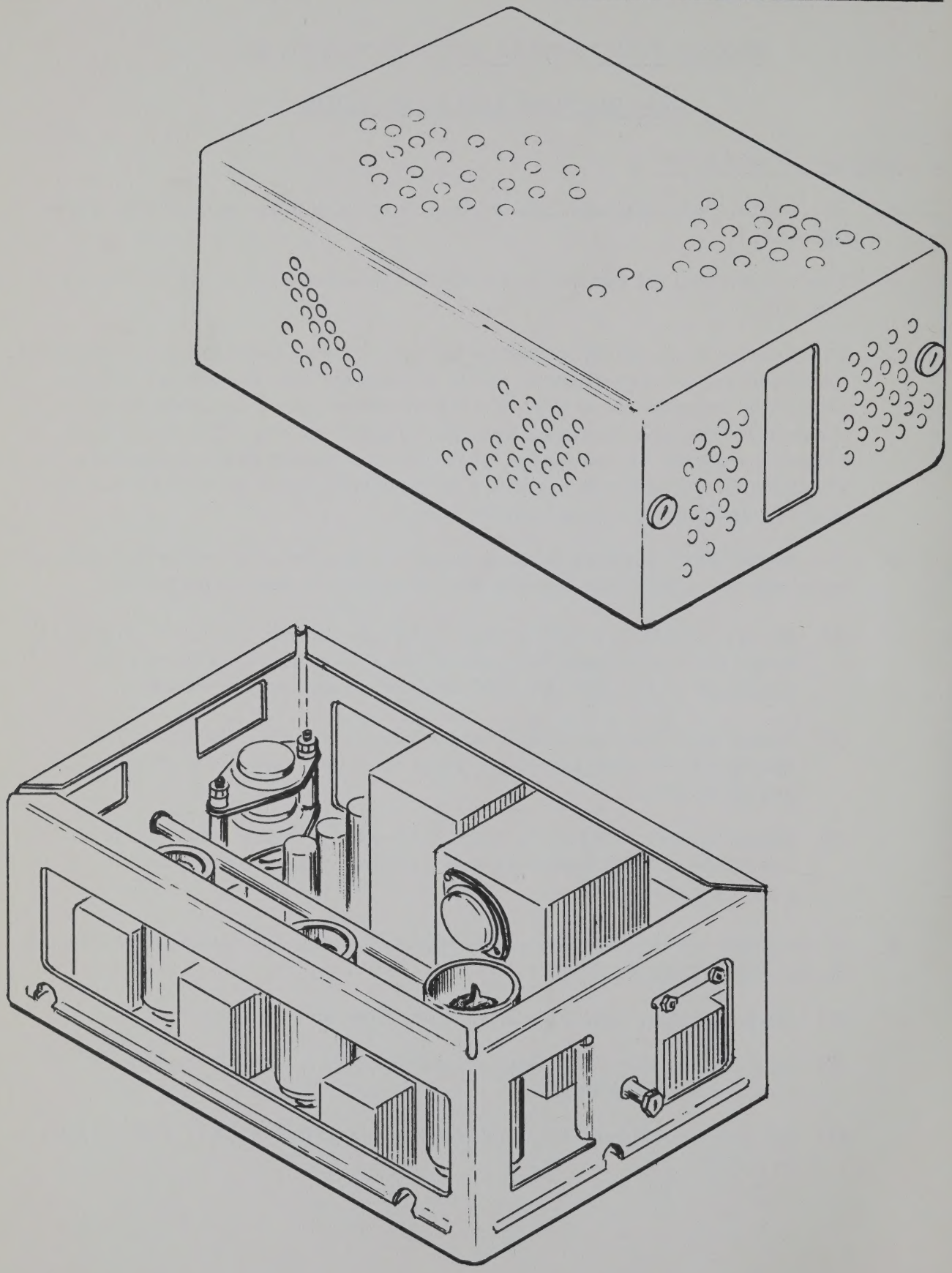


Figure 1
Model 5608 Marker Beacon Receiver

(4) A tuned 75-mc, quarter-wave, horizontally-polarized antenna. (Lear Part Number 97982 or equivalent).

(5) A half-module shockmount. (Lear Part Number 714010).

(6) An interconnecting cable. (Must be fabricated as indicated in figure 2).

(7) A primary power ON/OFF switch. (not supplied.)

F. The indicator light kits are available in four different configurations and include the following components:

(1) Part Number 714204-201: 6 light holder assemblies (2 white, 2 amber, and 2 blue), and 6 indicator lamps (Type G.E. No. 330 14V) for 14V operation.

(2) Part Number 714204-101: 3 light holder assemblies (1 white, 1 amber, and 1 blue), 3 indicator lamps (Type G.E. No. 330 14V), and three 120-ohm 3-watt shunt resistors, for 14V operation.

(3) Part Number 714204-202. 6 light holder assemblies (2 white, 2 amber, and 2 blue), 6 indicator lamps (Type G.E. No. 330 14V), and three 68-ohm 3 watt series dropping resistors for 28-volt operation.

(4) Part Number 714204-102: 3 light holder assemblies (1 white, 1 amber, and 1 blue), 3 indicator lamps (Type G.E. No. 330 14V), and three 120-ohm 3-watt shunt resistors for 28V operation.

All four of the light kits include a HI-LO Sensitivity switch and mounting plate. Each light holder assembly includes a PRESS-TO-TEST pushbutton.

G. The tube and transistor complement of the Model 5608 Marker beacon receiver is as follows:

Tube or Transistor	Type	Function
V-701	5654	R-F Amplifier
V-702	5654	R-F Amplifier
V-703a	6072	Grid Leak Detector
V-703b	6072	Audio Amplifier
Q-701	2N268	3000 cps Channel Output Amp.
Q-702	2N268	1300 cps Channel Output Amp.

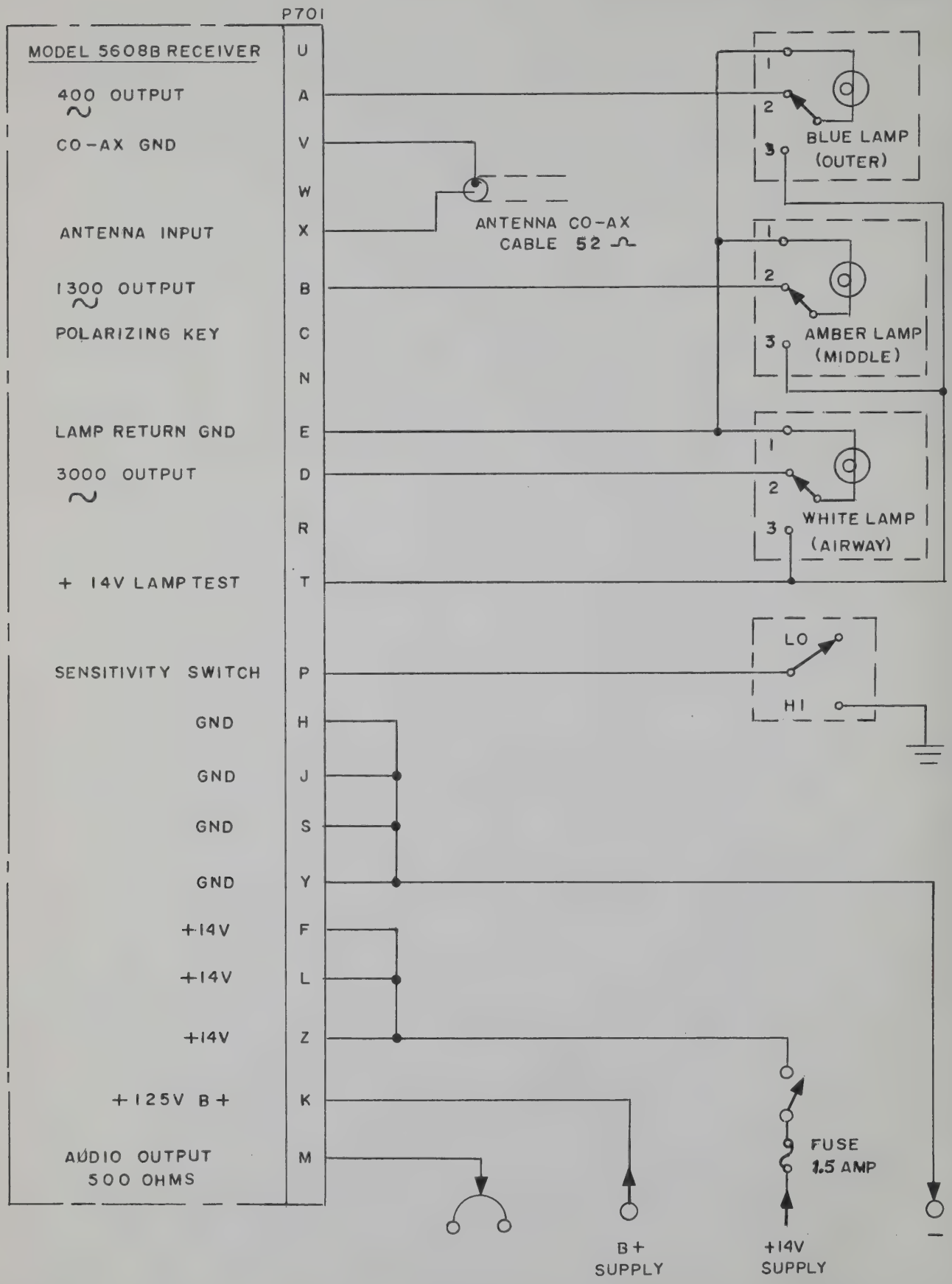


Figure 2
Complete Installation; Marker Beacon Receiver

Q-703	2N268	400 cps Channel Output Amp.
Q-704	2N139	3000 cps Channel Input Amp.
Q-705	2N139	1300 cps Channel Input Amp.
Q-706	2N139	400 cps Channel Input Amp.

H. The Model 5608 marker beacon receiver is manufactured by Lear Inc., Learcal Division, 3171 S. Bundy Drive, Santa Monica, California, U.S.A. Direct all inquiries regarding replacement parts to the Service Parts Department; and all other inquiries to the Sales Department at the above address.

2. Functional Operation

A. General

(1) The function of the marker beacon receiver is to receive and demodulate amplitude-modulated marker beacon transmissions, and provide the operator with an aural and visual identification of the particular marker beacon over which the aircraft is passing.

(2) The marker beacon module consists of a 4-stage fixed-tuned t-r-f receiver, and a frequency-selective 3-channel transistorized lamp amplifier.

(3) The aural indication is provided by a 500-ohm headset. The visual indications are provided by three colored lamps (white, amber, and blue), that are operated by the frequency-selective 3-channel transistorized amplifier.

(4) A panel-mounted HI-LO sensitivity switch provides two receiver-sensitivity ranges.

B. Block Diagram Discussion

(1) Receiver Operation

Figure 3 is a simplified block diagram of the Model 5608 marker beacon receiver. Audio modulated 75-mc marker beacon signals are amplified, detected, and applied simultaneously to a 500-ohm headset and a lamp actuator circuit, by a conventional t-r-f receiver. The t-r-f circuit consists of two r-f amplifiers, a grid-leak detector, and an audio output amplifier. The six interstage high-Q tuned LC circuits provide a high degree of selectivity. Automatic volume control voltage is developed at the grid-leak detector and applied to the two r-f amplifiers and

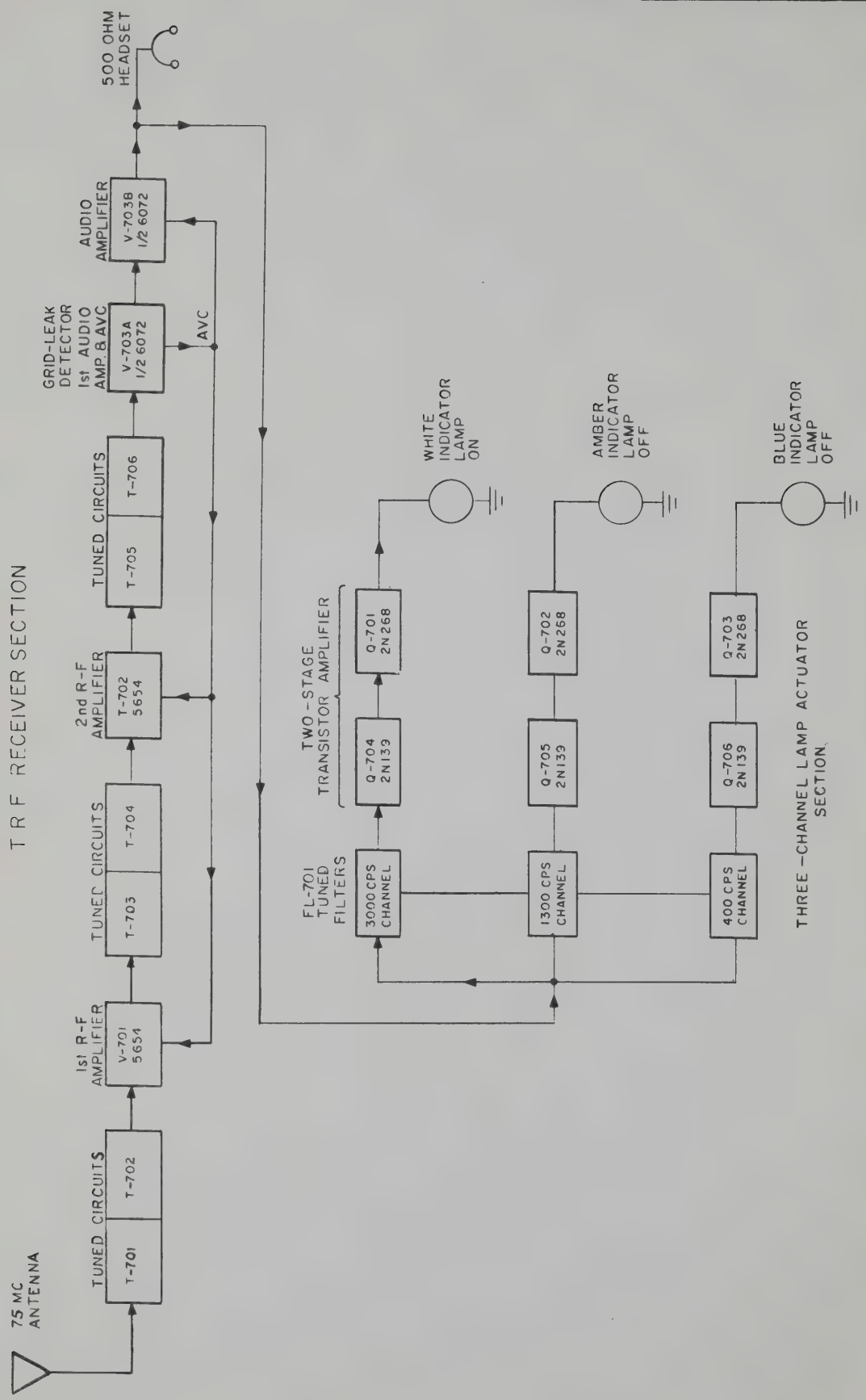


Figure 3
75 MC Marker Beacon Block Diagram

the audio amplifier.

(2) Lamp Amplifier Operation

The Audio output of the t-r-f receiver is applied to the lamp amplifier through a filter transformer with three tuned secondaries. The lamp amplifier consists of three two-stage transistorized channels. The frequency-selective characteristics of the transformer secondaries determines which of the three channels is actuated upon receipt of an audio signal. Under static conditions, i.e. in the absence of an audio signal, the first stage transistors of all three channels are conducting, and the output stages of all three channels are cut-off. The indicator lamps form the collector loads of the output stages, and under these conditions are unlit. The application of an audio signal to the input of one of the channels changes these conditions by cutting off the first stage and switching on the output stage of that particular channel. This results in a large output stage collector current that causes the channel indicator lamp to light. When one channel of the lamp amplifier is actuated, the remaining two channels are driven further into cut-off by an interacting bias circuit. This insures positive single-channel operation.

C. Detailed Circuit Operation

(1) R-F Circuits (See figure 4).

Impedance matching between the 50-ohm tuned antenna and the relatively high (5000-ohm) impedance input circuit of the first r-f amplifier is effected by connecting the antenna to the junction of capacitor C-703 and the 27-mmfd capacitor of the first parallel resonant circuit, T-701. With this connection the receiver input impedance, as seen by the antenna is approximately 50-ohms.

(2) Shielded parallel resonant circuits T-701 and T-702 are coupled capacitively (not inductively) through coupling capacitor C-702. The r-f voltage developed across T-702 is appled between the grid and cathode of r-f pentode V-701. Resistor R-701 is part of the avc filter, and capacitor C-705 provides an r-f grid return while isolating the avc voltage from ground. Resistor R-702 and capacitor C-706 form a conventional cathode-bias circuit. Resistor R-704 is a plate and screen dropping resistor, and in conjunction with capacitor C-708 provides plate de-coupling. Resistor R-703 and capacitor C-708 provide screen de-coupling.

Shielded parallel resonant circuit T-703 is the plate load of r-f amplifier V-701. The amplified r-f voltage developed across T-703 is applied to parallel resonant circuit T-704 and the grid-cathode input of r-f pentode V-702 through coupling capacitor C-710. The stage gain of V-701 is approximately 10.

(3) R-F Amplifier V-702 is similar in operation to V-701. The plate and screen 1000-ohm dropping resistor is omitted from the circuit of V-702. This increases the plate and screen voltages to 120-vdc. A tap at the junction of cathode resistor R-707 and potentiometer R-708 is grounded through the HI-LO sensitivity switch, when the switch is in the HI position. Potentiometer R-708 permits the gain of the receiver to be adjusted when the HI-LO switch is in the LO position. Shielded parallel resonant circuit T-705 is the plate load of V-702. R-F voltages developed across this circuit are coupled to parallel resonant circuit T-706 and the grid-cathode input of grid-leak detector V-703a through coupling capacitor C-715.

(4) Grid-Leak Detector and Audio Circuits

Operation of the grid-leak detector is based on the fact that the tube is operating on the curved portion of the grid-voltage/grid-current characteristic. Each positive half-cycle of r-f input voltage causes grid current to flow which charges the grid-side of capacitor C-716 to a negative potential. The time constant of resistors R-709 and R-705 and capacitor C-716 is such that C-716 cannot lose this charge during the succeeding negative half-cycle of r-f voltage. As a result, the operating point of the tube moves progressively left on the grid-voltage/plate-current characteristic until a point of equilibrium is reached at which the grid is so negative that the positive half-cycles of r-f voltage draw just sufficient grid current to maintain the charge on C-716. The net result is that the decrease in plate current due to the negative half-cycles of r-f voltage is greater than the increase in plate current due to the positive half-cycles and, as a result, audio detection takes place. Another way of regarding the grid-leak is to consider the grid and cathode of V-703a as a diode detector, the audio output of which is amplified by the triode as a whole.

(5) The d-c component of the demodulated signal is developed across R-709 and R-705 to provide negative avc bias. The grid returns of V-701, V-702, and V-703b are connected to the junction of R-709 and R-705. Capacitor C-709 provides audio filtering for the avc line. The plate of V-703a is resistance-capacitance coupled to the grid-cathode input of audio amplifier V-703b

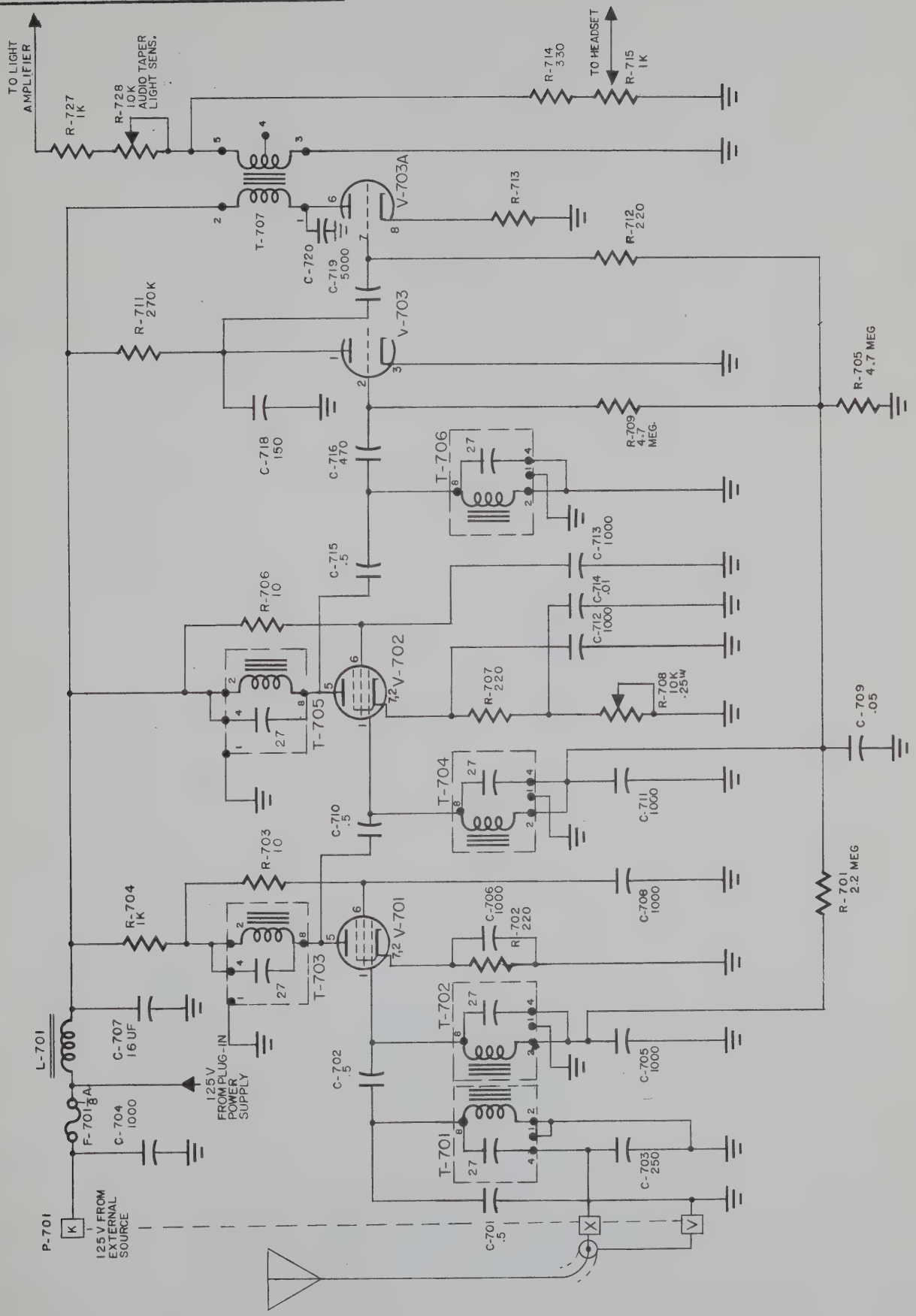


Figure 4
75 MC Marker Beacon Partial Schematic

through capacitor C-719 and resistor R-712. Capacitor C-718 functions as an r-f filter that provides a low-impedance path to ground for any r-f components in the plate circuit of V-703a. Plate dropping resistor R-711 reduces the plate voltage of V-703a to 42 volts. The stage gain of V-703a is approximately 10.

(6) V-703b is a conventional audio amplifier. Audio signals in the plate circuit are coupled to the load through output transformer T-707. Plate voltage (120-vdc) is fed to the tube through the primary of T-707. R-F de-coupling is provided by capacitor C-720. Cathode resistor R-713 is un-bypassed. This provides negative feedback to the input circuit of the tube which stabilizes the gain and reduces the distortion of the stage. The gain of the output stage is approximately 10.

(7) Two loads are connected in parallel across the secondary of output transformer T-707. The first of these consists of resistor R-714 in series with potentiometer R-715 which couples the audio output signal to a 500-ohm headset. The second load consists of potentiometer R-728, resistor R-727, and the primary of tuned-filter transformer FL-701, connected in series. The tuned secondary circuits of FL-701 provide the inputs to the lamp amplifier channels. Potentiometer R-728 functions as a visual-signal gain control.

(8) Lamp Amplifier Circuits (See figure 5).

The operation of the lamp amplifier circuit differs from the idealized description of paragraph 2B-(2) in that the input and output transistors of a particular channel are not driven from full conduction to zero conduction and vice versa upon receipt of an audio trigger-signal from the t-r-f receiver. In the actual circuit operation the bias arrangements are such that collector currents are flowing in both transistor stages, even without an audio input signal. The function of the audio input signal is to increase the collector current of the output stage by decreasing the collector current of the input stage. It accomplishes this function by decreasing the forward bias on the input stage, which in turn, results in an increase of the forward bias on the output stage.

(a) Lamp OFF Condition (See figure 6).

Figure 6 is a simplified schematic of the 3000-cps lamp amplifier channel in the lamp OFF condition. The currents and voltages indicated are representative of a typical marker

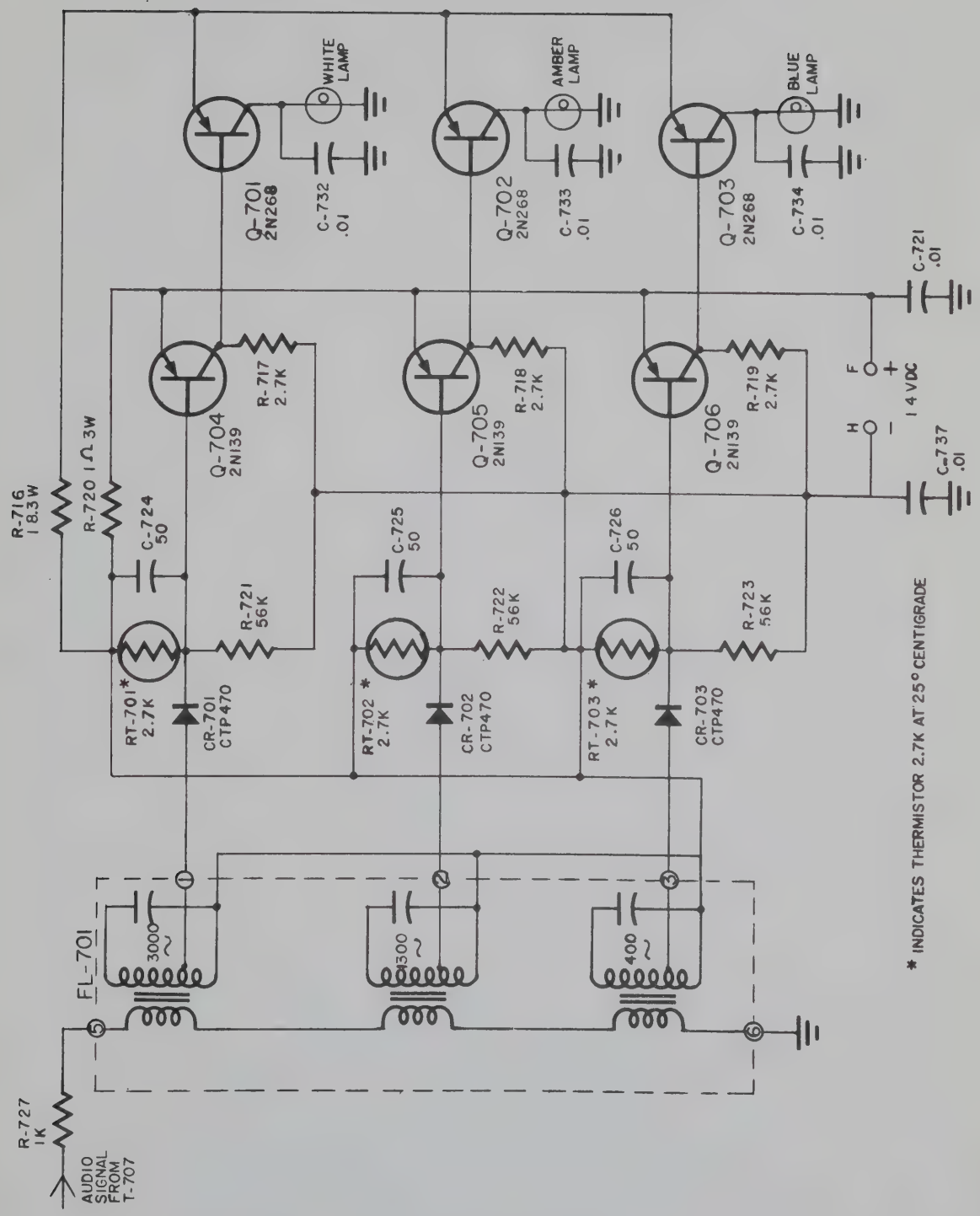


Figure 5
Lamp Amplifier Circuits

beacon receiver. Under static conditions i.e. with zero audio input signal to tuned-filter transformer FL-701, transistor Q-704 is conducting a relatively-high collector current, and transistor Q-701 is conducting a relatively low collector current. The term "relative" refers to the value of collector current that flows upon receipt of an audio-trigger signal from the t-r-f receiver. As shown in figure 6, the collector current of input transistor Q-704 is 5.0-ma, while that of output transistor Q-701 is 16.0-ma. This latter value (16-ma) is below the threshold current level of the indicator lamp, and so the lamp is unlit. The bias circuit that establishes these static operating conditions is as follows. The emitter of Q-704 is connected directly to the plus terminal of the 14-vdc primary supply. The base of Q-704 is connected to the junction of thermistor RT-701 and resistor R-721, which in series with resistor R-720 forms a voltage divider across the 14-vdc supply. This places the base at a potential of + 13.7-vdc to ground, and at a potential of - 0.3-vdc with respect to the emitter. Under these conditions the transistor is forward-biased to conduction. The emitter current is 5.15-ma, the base current is 150-ua, and the collector current is 5.0-ma. The collector current flows through collector-load resistor R-717, and developes a voltage-drop across it which is applied to the base of output transistor Q-701. This voltage-drop is 13.0-vdc to ground. The emitter of Q-701 is connected to the 14-vdc supply through resistors R-716 and R-720, and has a potential of approximately 13.1-vdc to ground. Thus the base has a potential of - 0.1-vdc with respect to the emitter. Under these conditions Q-701 is considered to be cut-off, although a collector current of 16-ma is flowing. This is because the collector current of 16-ma is insufficient to light the lamp.

NOTE

The current values quoted above will vary considerably with different transistors. The collector current of a transistor, with any given forward-bias is a function of the d-c gain of the transistor. The d-c gain of a transistor is the ratio of the collector current to the base current. In the case described above, Q-704 has a current gain of 5000/150 = 33 (approximately), and Q-701 a current gain of 16/0.2 = 80. The higher the current gain of

Q-704 the lower will be the residual (collector) current of Q-701 when the lamp is unlit, i.e. Q-704 in full conduction, Q-701 relatively cut-off. If the gain of Q-704 is too low, the voltage-drop across the collector load of Q-704 will be insufficient to bias the base of Q-701 to relative cut-off, and the lamp will be on continuously, with or without an input signal to the channel. If the gain of Q-704 is too high, the input signal may not reduce the forward bias (and hence the collector current) sufficiently to carry Q-701 from relative cut-off to full conduction. The required d-c current gain for optimum operation is found when Q-704 has a Beta of 50 to 60; and Q-701 has a Beta of 60 to 90. (Beta is defined as the d-c gain of the transistor, i.e. ratio of collector current to base current, with the collector shorted to the emitter.)

(b) Lamp ON Condition

Figure 7 is a simplified schematic of the lamp amplifier channel in the ON condition. The voltage developed across the tapped-secondary of tuned-filter FL-701 in response to an audio input signal is rectified by diode CR-701, and appears as a d-c voltage across capacitor C-724. The magnitude and polarity of this d-c voltage is shown in figure 7. The injected d-c voltage raises the base potential of Q-704 from + 13.7 to + 13.95-vdc, and in so doing reduces the forward-bias from - 0.3 to - 0.05-vdc. This drives Q-704 towards cut-off and reduces the collector current from 5-ma to 3.2-ma. The reduced voltage-drop across collector-load resistor R-717 increases the forward-bias on Q-701, causing the collector current of Q-701 to increase from 16-ma to 112-ma. This increased collector current causes the lamp to light. The increased current flowing through Q-701 (emitter to collector) increases the voltage-drop across R-716 and as a consequence reduces the emitter voltage of Q-701 from 13.1-vdc to 11.85-vdc. Simultaneously, the increased base current of Q-701 (from 0.2 to 1.4-ma) flowing through load resistor R-717, produces a final base voltage at Q-701 of 11.5-vdc. The resulting forward bias on Q-701 is thus - 0.35-vdc.

Figure 6
3000 CPS Channel: Lamp Off

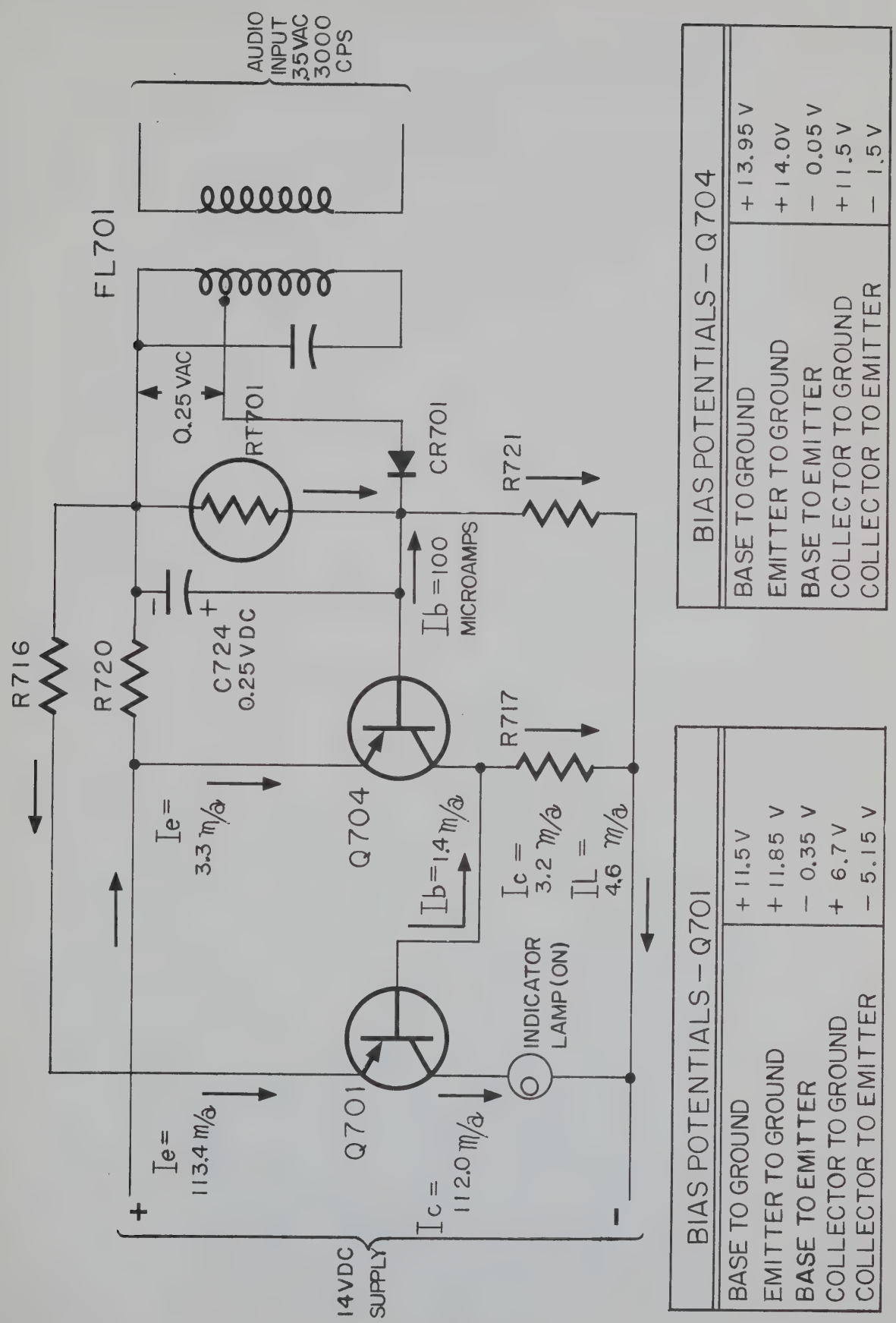


Figure 7
3000 CPS Channel: Lamp On

(c) Interchannel Bias Control Circuit

When one channel is activated by means of an audio input signal, the remaining two channels are further de-activated by means of an automatic inter-channel bias control circuit. The inter-channel bias control circuit automatically increases the forward bias of the input stages of the two remaining channels, and at the same time decreases the forward-bias of the output stages of the same channels. In fact, the output stages of the two de-activated channels are driven to a reverse-bias condition, i.e. the bases become positive with respect to the emitters. This inter-channel bias control is a protective feature designed to insure positive single-channel operation. Figure 8 is a simplified three-dimensional schematic of the lamp amplifier circuit. The current and bias voltages indicated represent static conditions, i.e. zero audio signal input at all three channels. These values correspond to the values listed in figure 6 for a single channel, and were measured on the same unit. As illustrated, the three 1st stage transistors Q-704, Q-705, and Q-706, are forward-biased by - 0.3V, while the three output stage transistors Q-701, Q-702, and Q-703, are forward-biased by - 0.1V. Under these conditions the residual collector current in each of the output stage transistors is 16-ma, which is insufficient to light the indicator lamps.

Figure 9 is a simplified three-dimensional schematic of the lamp amplifier circuit with an audio input signal applied to the 3000-cps channel. The rectified injected audio voltage raises the base potential of Q-704 from 13.7 to 13.95V, and as a consequence reduces the forward-bias of Q-704 from - 0.3V to - 0.05V. The collector current of Q-704 then decreases from 5-ma to 3.2-ma. The corresponding reduction in the base potential of Q-701 causes a large emitter-collector current (113.4-ma) to flow through the transistor. This increases the base current of Q-701 from 0.2-ma to 1.4-ma. The resultant current through collector load resistor R-717 is the sum of the base current of Q-701 (1.4-ma) and the collector current of Q-704 (3.2-ma), and equals 4.6-ma. The voltage-drop across R-717, which is the base potential of Q-701, thus finalizes at 11.5V. The increased emitter current of 113.4-ma flowing through R-720 and R-716 reduces the emitter voltages of Q-701, Q-702, and Q-703 from 13.1V to 11.85V. As a result, Q-701 is forward-biased by - 0.35V and Q-703 and Q-704 are reverse-biased

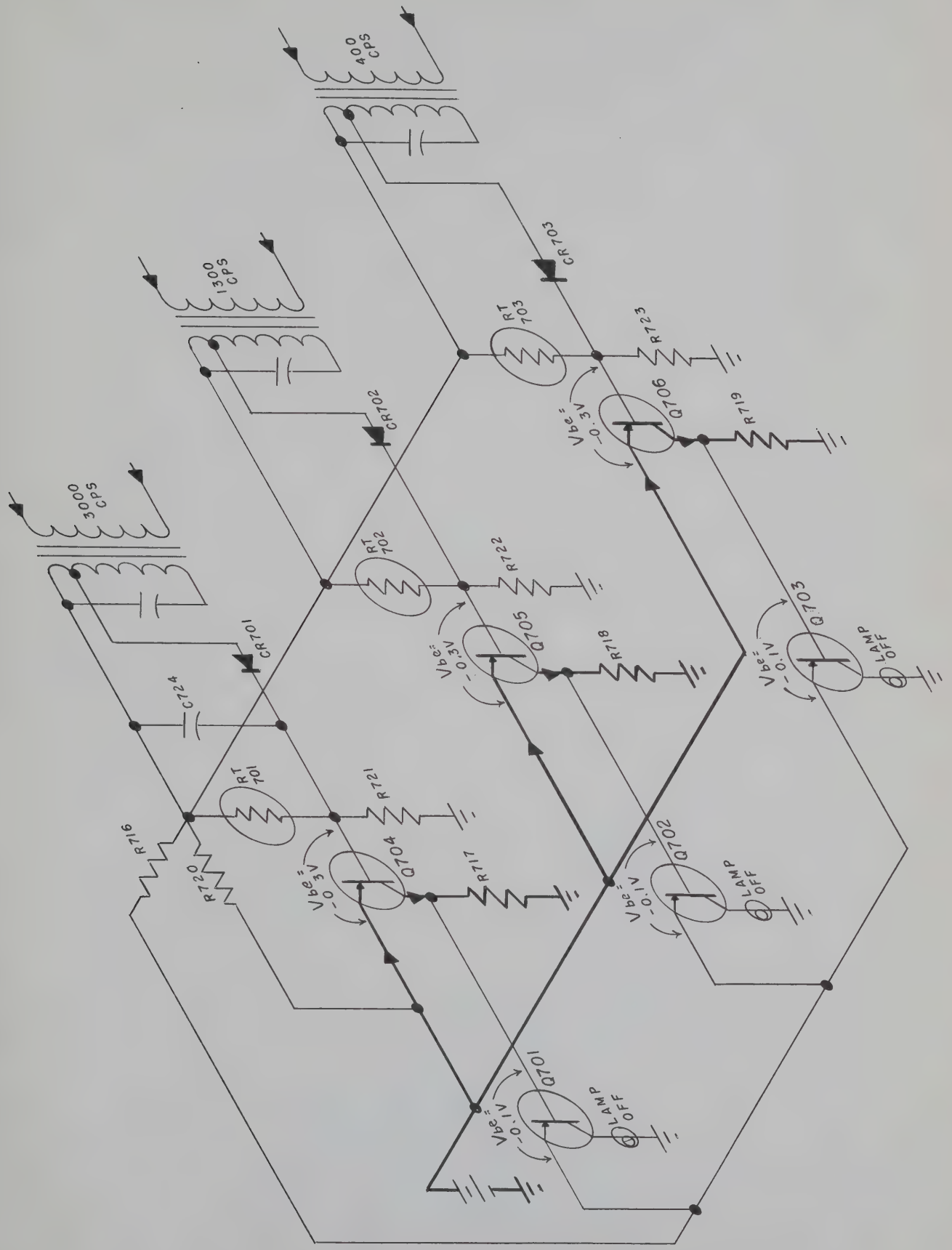


Figure 8
3-Channel Lamp Amplifier With Zero Inputs

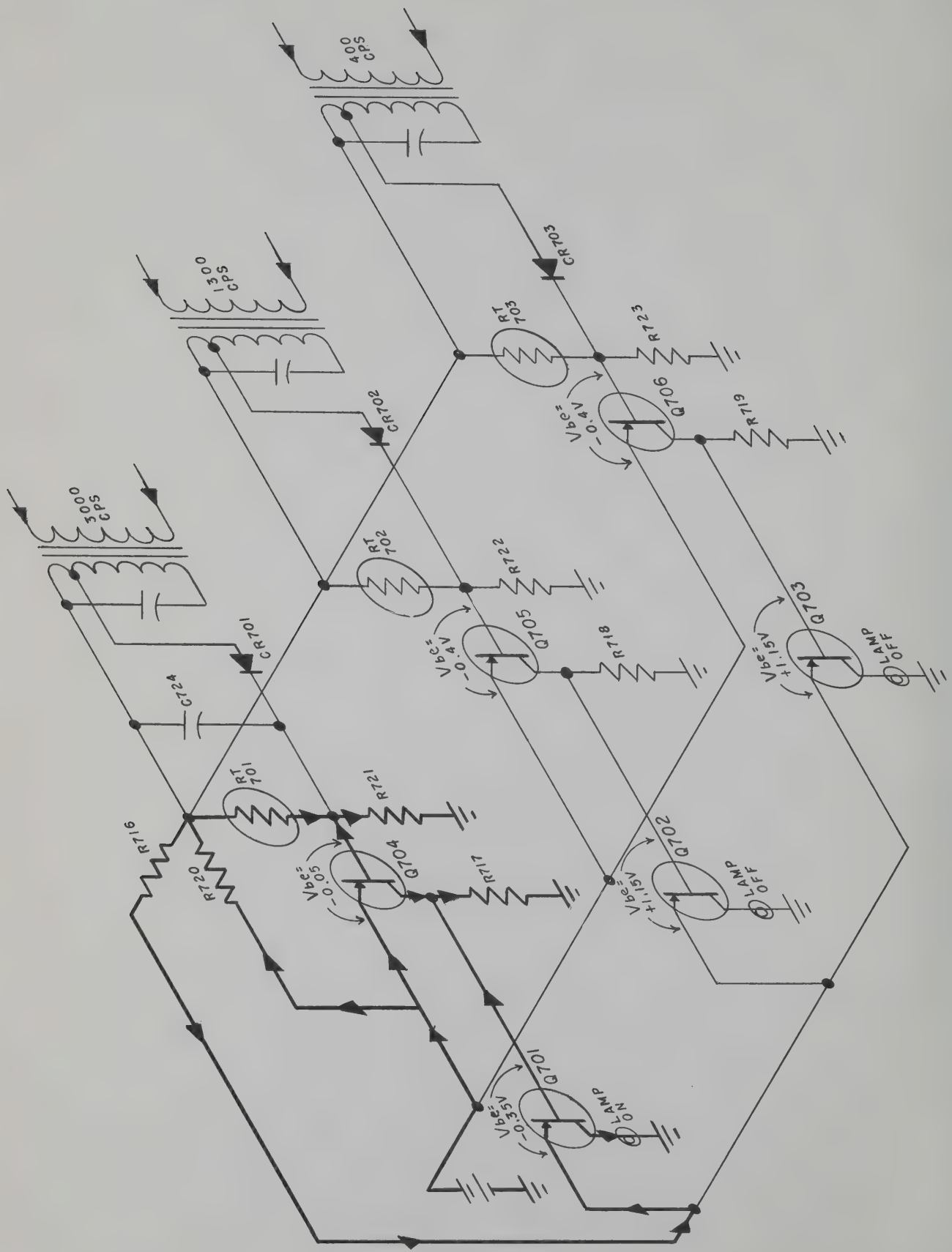


Figure 9
3-Channel Lamp Amplifier
With 3000 CPS Channel Activated

$\neq$ 1.15V. This means that Q-701 is in full conduction, while Q-703 and Q-704 are completely cut-off.

In addition, the emitter current (113.4-ma) through Q-701 increases the voltage-drop through the 1-ohm resistor R-720 so that the base voltages of Q-705 and Q-706 are reduced from 13.7v to 13.6V through their respective voltage-divider networks. This increases the forward bias on Q-705 and Q-706 from -0.3v to -0.4v, thereby driving these two elements further into conduction. The final result of the bias interaction between the three channels is that the output stages of the two de-activated channels (Q-702 and Q-703) are reverse-biased to cut-off, while the input stages of the same channels (Q-705 and Q-706) are forward-biased to greater conduction.

(d) Temperature Compensation

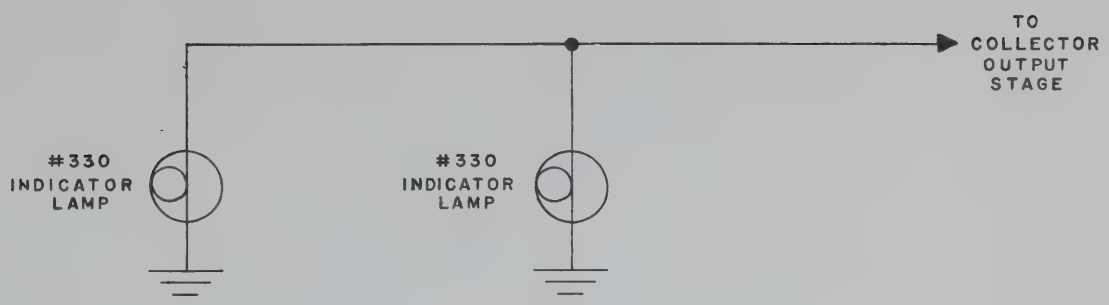
Temperature compensation is employed in the lamp amplifier circuits to compensate for variations in transistor characteristics due to changes in ambient temperature. Each amplifier channel is, to a degree, self-compensating, due to the fact that the two stages work in opposition to each other, i.e. an increase in the collector current of the 1st stage produces a decrease in the collector current of the 2nd stage. As an increase in ambient temperature produces an increase in collector current, the two effects tend to cancel each other. This cancellation would be more complete if the two stages employed the same type of transistor, which of course is not the case.

Additional temperature compensation is provided by the use of thermistors as one branch of the voltage-dividers that determine the base potentials (and hence the forward-bias) of transistors Q-704, Q-705, and Q-706). Thermistors are non-linear resistors with negative temperature coefficients. As the ambient temperature increases, the resistance of the thermistor decreases. Due to the action of the voltage-dividers this reduces the forward-bias of Q-704, Q-705, and Q-706 sufficiently to compensate for the increased collector current caused by the increase in temperature.

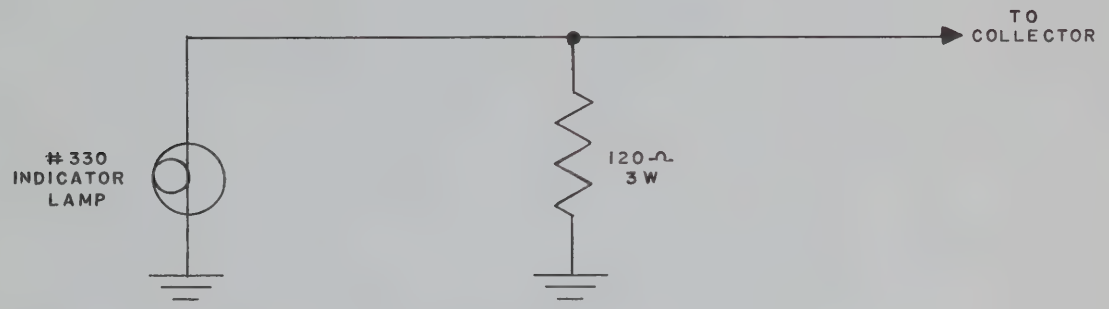
(e) Indicator Lamp Circuits

The indicator lamps form the collector output loads of the three lamp amplifier channels. Four lamp circuit configurations are available, all of which provide the same collector load to the

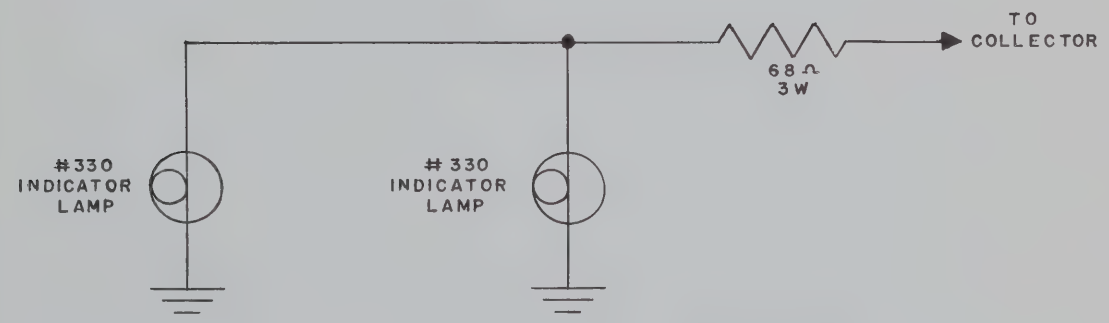
amplifier channels, under differing installation requirements. Figure 10 shows the lamp circuits for single and dual lamp installations with either a 14-vdc or 28-vdc primary power source. The lamps used are G.E. Type No. 330 with a nominal rating of 12v, 0.08 amps. At threshold operation (6 v across the lamp) the collector load requirement is 60-ohms. For 14 v installations this value is obtained with two No. 330 lamps in parallel for dual installations, or a single lamp and a 120-ohm resistor in parallel, for single installations. For 28v installations, a 68-ohm dropping resistor is placed in series with the two 14v configurations.



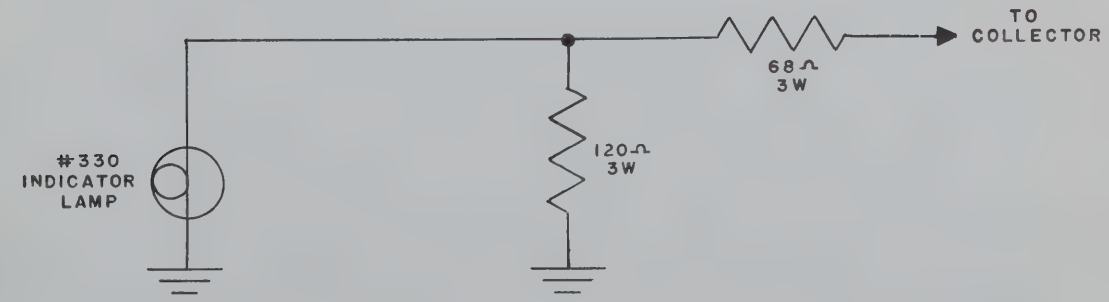
(A) 14 VDC DUAL INSTALLATION



(B) 14 VDC SINGLE INSTALLATION



(C) 28 VDC DUAL INSTALLATION



(D) 28 VDC SINGLE INSTALLATION

MODEL 5608 MARKER BEACON RECEIVER

TROUBLESHOOTING

1. Job/Use

Table 1 lists the equipment required to service the marker beacon receiver. The trouble localization chart, Table 2, lists the symptoms and probable causes of typical malfunctions that may occur during receiver operation. The troubles contained in Table 2 are not all inclusive, but only those which may occur more frequently. Whatever the reported malfunction may be, it should be verified by applying a properly modulated 75-mc signal to the equipment and observing the results. If the suggested corrective measures fail to uncover the malfunction, the receiver should be checked stage by stage as outlined paragraph 3 F.

2. Special Tools, Fixtures, and Equipment.

No special tools, fixtures, or equipment are required; however the following standard test equipment is necessary:

TABLE 1

TEST EQUIPMENT REQUIRED

MANUFACTURER & PART NO. OR MODEL	NAME	DESCRIPTION AND USE
Hewlett-Packard Model 608D or equivalent.	R-F Signal Generator	Alignment and Performance Tests. Must have variable output attenuator and be capable of generating 75-mc with an output impedance of 50-ohms.
	75-mc Crystal Calibrator	To calibrate r-f signal generator with an accuracy of $\pm$ 0.01%.
Hewlett-Packard Model 801.	Vacuum Tube Voltmeter	For ac/dc low-level voltage, current, and resistance measurements. Capable of

		measuring a-f and r-f voltages.
Kaylab Model 203	D-C Microvolt-Ammeter	For d-c low-level voltage and current measurements. Especially recommended for use with transistors.
General Radio Model 583-A	Output Meter	For measuring audio output power.
Hewlett-Packard Model 200CD	Audio Oscillator	To make audio stage gain measurements, and modulate the r-f signal generator. Must be capable of generating 400, 1300, and 3000-cps and have variable output control.
Opad-Green GPA 2810 or equivalent	Primary Power Supply.	Must be capable of delivering 14-vdc at 1 ampere, or 28-vdc at 0.5-ampere.
Dressen-Barnes Model 3-150B or equivalent.	Voltage Supply.	Must be capable of delivering 125-vdc at 20-ma for receiver B plus voltage.
Must be fabricated.	Interconnecting cable.	Connects equipment for normal operation and for bench test and alignment purposes.

3. Procedures.

A. Localize troubles as indicated in Table 2.

(1) Make Job Setup

DETAIL STEPS/WORK ITEMS KEY ITEMS

(a) Remove perforated cover from receiver.

(b) Connect receiver to test equipment as shown in figure 1.

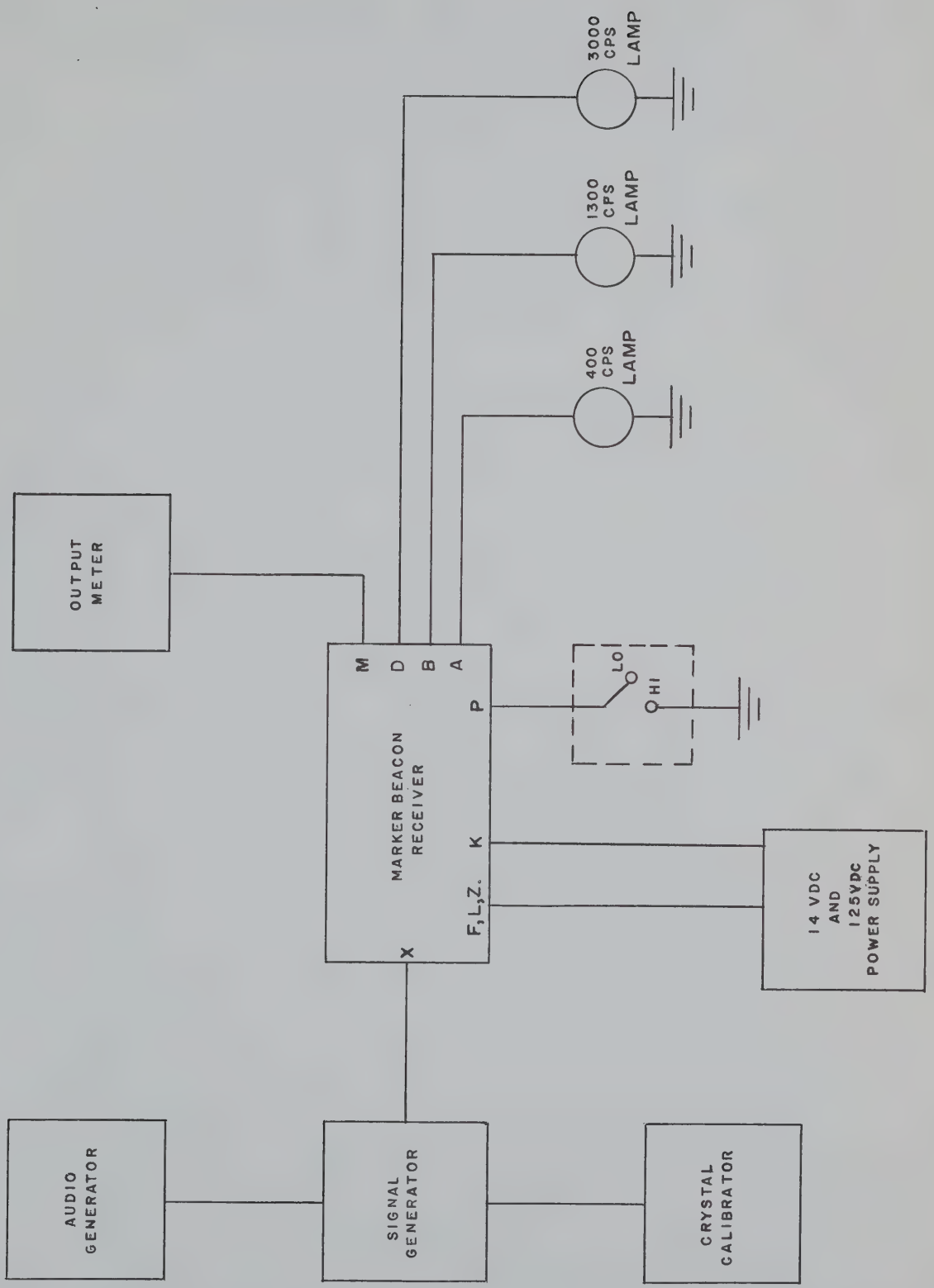


Figure 1
Test Set-up Connections

(c) Switch the receiver ON. Apply to the input a 75-mc signal, modulated 30% by a 400, 1300, and 3000-cps audio signal in succession. Adjust the level of the r-f signal to 500-uv. Switch HI-LO switch to HI position. Make sure HI-LO switch is in HI position.

(2) Perform Check

(a) Verify reported symptom by observing output meter, indicator lamps, and VTVM readings.

(b) Take corrective measures as suggested in Table 2

TABLE 2

Trouble Shooting Chart: Marker Beacon Receiver

Failure	Probable Cause	Suggested Corrective Measures
Receiver completely inoperative	1. No primary d-c. 2. No B + voltage 3. Open fuse F-701. 4. Open choke L-701. 5. Defective Tube. 6. Open inter-stage tuning coil.	1. Measure Primary d-c. 2. Measure B + voltage at plate of each tube. 3. Check and replace fuse. 4. Check and replace choke. 5. Check tubes with tube-checker. 6. Check inter-stage coils for continuity and replace if necessary.
All three indicator lamps do not operate: but audio signals audible.	1. R-728 set incorrectly or open. 2. R-727 open. 3. Primary of FL-701 open or shorted. 4. Open in common-lamp return lead (terminal E, Connector P-701).	1. Measure a-f voltage at pin 5 of T-707. Should be approximately 1.5 v rms. If so, measure a-f voltage at pin 5 of FL-701 while

Failure	Probable Cause	Suggested Corrective Measures
		adjusting R-728. Should be approximately 0.35 v rms. If no voltage present, check R-728 and R-727 for resistance and continuity. Check interconnecting cable and connector P-701 for open in lamp return lead.
Indicator lamps operate correctly but no audio output on output meter or in headset.	R-715, or R-714, or headset winding open.	1. Make resistance and continuity checks on R-715, R-714, and headset winding.
Receiver operates O.K. except one indicator lamp does not light.	1. Indicator lamp bulb burned out. 2. 1st stage transistor gain too high. 3. Defective Thermistor. 4. Defective tuned-secondary on FL-701.	1. Use PRESS-TO-TEST button to check lamp bulb. 2. Remove 1st stage transistor from socket. If lamp lights replace 1st stage transistor. If lamp does not light make voltage and resistance measurements as indicated in Tables 5, 6, and 7 to locate defective component and then replace. 3. Check resistance and continuity. 4. Measure a-f secondary voltage; should be 0.25 v rms.

Failure	Probable Cause	Suggested Corrective Measures
	5. Defective crystal rectifier. 6. Defective output transistor.	5. Measure forward and reverse resistance of rectifier. 6. Replace.
Receiver operates O. K. except indicator lamp of one channel lit continuously, with no input signal.	1. 1st stage transistor has insufficient gain. 2. Collector load resistor R-717, R-718, or R-719 too low in value. 3. 2nd stage transistor gain too high.	1. Replace. 2. Measure and replace. 3. Measure base-emitter forward bias on transistor. It should not exceed -0.1-vdc with no signal input. Collector current should not exceed 30-ma with no signal input.
Receiver operates O. K. except two channels operate simultaneously, when signal input applied to one.	1. Tuned filter FL-701 2. Thermistor.	1. Measure d-c voltage across filter capacitor (C-724, C-725 or C-726) of affected channel. It should be 0.25-vdc. Measure d-c voltage across remaining two filter capacitors. It should be 0.07-vdc or less. 2. If these voltages O. K. check resistance value of thermistor in affected channel.
Indicator lamps operate with high (over 2500-uv) input signal only.	1. HI-LO switch ungrounded. 2. R-728 open or set incorrectly.	1. Check switch by shorting R-708 to ground. 2. Check R-728 by shorting it out of the circuit.

Failure	Probable Cause	Suggested Corrective Measures
	3. Receiver insensitive.	3. Check tubes in tube-checker. Make stage gain checks as outlined in paragraph F.
Lamps operate too brightly and frequently burn out.	1. AVC circuit inoperative.	1. Measure d-c voltage from junction of R-705 and R-709 to ground, while increasing r-f input signal and compare with values in table 2 Section 34-8-3. If no voltage observed, check for ground on avc line. Check R-705, C-709, C-705 and C-711 for short.
Lamp brilliance varies (bright-dim) periodically.	1. Grid-leak detector blocking.	1. R-709 or R-705 too high in value.

B. Make tube-socket voltage measurements.

(1) Make job setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Remove perforated cover from receiver.	
(b) Apply primary d-c and B + to receiver.	
(c) Throw HI-LO switch to HI position.	

(2) Perform Check

(a) Use voltmeter to measure d-c voltages from the tube-socket pins to ground	Use 20,000 ohm-per-volt multimeter or VTVM.

(b) Compare voltage readings with the values listed in table 3.	Values should agree within ± 10%.

TABLE 3

TUBE SOCKET VOLTAGE MEASUREMENTS

TUBE	SOCKET PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V-701	-0.43	1.8	0.0	7.0	115.0	115.0	1.8	-	-
V-702	-0.43	1.9	7.0	14.0	120.0	120.0	1.9	-	-
V-703	42.0	-0.86	0.0	14.0	0.0	120.0	-0.43	0.6	7.0

C. Make tube-socket resistance measurements.

(1) Make Job Setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Remove perforated cover from the receiver.	
(b) Disconnect primary d-c and B + voltages from receiver.	
(c) Throw HI-LO switch to HI position.	

(2) Perform Check.

(a) Use multimeter to measure resistance between tube-socket pins and ground.	Use 20,000 ohm-per-volt multimeter or VTVM.
(b) Compares resistance readings with the values listed in table 4.	Values should agree within ± 10%.

TABLE 4

TUBE SOCKET RESISTANCE MEASUREMENTS

TUBE	SOCKET PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V-701	7 M	220	0.0	3.6	1M ≠	1M ≠	220	-	-
V-702	4.7M	220	3.6	5.0	1M ≠	1M ≠	220	-	-
V-703	1M ≠	9.5M	0.0	5.0	0.0	-	5.2M	220	5.0

D. Make lamp amplifier voltage measurements.

(1) Make Job Setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Remove perforated cover from receiver.	
(b) Connect receiver to test equipment as shown in figure 11, section 34-8-3.	
(c) Apply primary d-c and B ≠ to the receiver.	

(2) Perform Check

(a) Use VTVM to measure the transistor electrode voltages as indicated in Table 5, with no signal input to the receiver.

(b) Use VTVM to measure the transistor electrode voltages with a modulated 75-mc signal applied to one channel as indicated in Table 5.

(c) Use VTVM to measure the transistor electrode voltages of the remaining two channels when one channel actuated as in step (b), and compare with values listed in Table 6.

TABLE 5

TRANSISTOR VOLTAGES-ACTUATED CHANNEL

TYPE	EMITTER	BASE	COLLECTOR	BASE EMITTER	COLLECTOR EMITTER	CONDITION
2N139	⨦14.0	⨦13.7	⨦13.0	-0.3	-1.0	Lamp Off
2N139	⨦14.0	⨦13.95	⨦11.5	-0.05	-1.5	Lamp On
2 N268	⨦13.1	⨦13.0	⨦ 0.6	-0.1	-12.5	Lamp Off
2N268	⨦11.85	⨦11.5	⨦6.7	-0.35	-5.15	Lamp On

TABLE 6

TRANSISTOR CURRENTS - ACTUATED CHANNEL

TYPE	EMITTER	BASE CURRENT	COLLECTOR CURRENT	COLLECTOR-BASE CURRENT GAIN	CONDITION
2N139	5.15-ma	150-ua	5.0-ma	33	Lamp Off
2N139	3.3-ma	100-ua	3.2-ma	32	Lamp On
2N268	16.2-ma	0.2-ma	16.0-ma	80	Lamp Off
2N268	113.4-ma	1.4-ma	112.0-ma	80	Lamp On

E. Make lamp amplifier current measurements.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(1) Make Job Setup as in paragraph D preceding.	
(2) Perform Check.	
(a) Use low-resistance milliameter microammeter connected in series with relevant transistor electrode, as indicated in Table 7. Measure current with channel de-activated.	With individual transistors current values may differ by as much as ⨦ 30% from those listed in Table 7.

(b) Apply modulated 75 mc signal to same channel as in step (a) and make current measurement.

(c) Compare current values in steps (a) and (b) with those listed in table 7.

TABLE 7

TRANSISTOR VOLTAGES ON REMAINING CHANNELS WHEN ONE CHANNEL ACTUATED

TRANSISTOR	EMITTER	BASE	COLLECTOR	BASE EMITTER	COLLECTOR-EMITTER
2N139	∤14.0	∤13.6	∤13.0	-0.4	-1.0
2N268	∤11.85	∤13.0	0.0	∤1.15	-14.0

F. Make Stage Gain Measurements.

(1) Make Lamp Amplifier Gain Setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Connect output of audio oscillator to pin 5 of output transformer T-707.	
(b) Connect d-c VTVM across the WHITE indicator lamp in the collector circuit of Q-701.	3000-cps channel. Procedure for other two channels is identical.
(c) Connect 500-ohm load or output meter across the receiver audio output.	Pin M of Connector P-701.

(2) Perform Lamp Amplifier Gain Measurement.

(a) Tune the audio oscillator to 3000 cps and increase the output level to 1.5v rms.

(b) Adjust R-728 until the d-c VTVM reads approximately 6-vdc (threshold lamp voltage.)

Vary tuning of the audio oscillator slightly to obtain maximum reading on the VTVM, and re-adjust R-728 if necessary to maintain lamp voltage at 6-vdc.

(c) Adjust R-715 until the output meter reads 1-mw into 500 ohms.

(d) With an input voltage to the lamp amplifier of 1.5v rms, the lamp should light and the voltage across the lamp should be 6-vdc plus or minus 1-vdc.

NOTE

If, during the above test, the output meter reads correctly, but there is no indication on the d-c voltmeter, then connect the output of the audio oscillator to the primary of the tuned-filter transformer (pin 5 of FL-701) and adjust the audio output to 0.35v rms. If the lamp now goes ON and the VTVM reads correctly this indicates either an open potentiometer R-728 (separation of the wiper from the winding.) If the lamp remains OFF and the VTVM does not indicate, remove the 1st stage transistor 2N139 (Q-704 in the 3000 cps channel) from its socket. The lamp should now light. If it does not, check the bulb by depressing the PRESS-TO-TEST button. If bulb checks out correctly the trouble is probably in the output stage transistor 2N268 (Q-701 in the 3000-cps channel). Check by replacing the transistor.

(3) Make Amplifier V-703b Gain Setup.

DETAIL STEPS/WORK ITEMS KEY ITEMS

(a) Connect output of audio oscillator to pin 7 of audio amplifier V-703b through isolating capacitor.

(b) Connect a-c VTVM from pin 6 of V-703b to ground.

(4) Perform V-703b Gain Measurement.

(a) Tune the audio oscillator to 3000-cps and increase the output level until the VTVM reads 12.0v rms.

(b) The voltage output of the audio oscillator should be 1.2v rms, indicating a stage gain of 10.

(5) Make Detector/Amplifier V-703a Gain Setup.

(a) Connect output of r-f generator to pin 2 of V-703a.

(b) Connect the VTVM to pin 6 of V-703b and ground.

(6) Perform V-703a Gain Measurement.

(a) Adjust the r-f generator to 75-mc, modulated 30% at 3000-cps.

(b) Adjust output level of r-f generator to 120,000-uv.

(c) The VTVM should read 12.0v rms, indicating a stage gain of 10 for V-703a.

NOTE

If the VTVM reads incorrectly in the preceding step (c), connect the VTVM from pin 1 of V-703a to ground. The VTVM should read 1.2v rms. If it does the trouble is localized to V-703b. If it does not the trouble is localized to V-703a.

(7) Make R-F Amplifier V-702 Gain Setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Connect output of r-f generator to pin 1 of V-702.	

(8) Perform Gain Measurements as follows:

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Tune r-f generator to 75-mc modulated 30% at 3000-cps.	
(b) Connect the VTVM and observe the readings as follows; with an output level of 12,000-uv.	

a. Pin 6 of V-703b: 12.0v rms
b. Pin 1 of V-703a: 1.2v rms
c. Pin 2 of V-703a: 0.12v rms

(9) Make R-F Amplifier V-701 Gain Setup.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Connect output of r-f generator to pin 1 of V-701.	

(10) Perform Gain Measurements as follows:

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Connect the VTVM and observe the readings as follows, with an output level of 1200-uv.	

a. Pin 6 of V-703b: 12.0v rms
b. Pin 1 of V-703a: 1.2v rms
c. Pin 2 of V-703a: 0.12v rms
d. Pin 1 of V-702: 12,000-uv

(11) Make Overall Receiver Gain Setup

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(a) Connect output of r-f generator to pin X of connector P-701.	

(12) Perform Gain Measurements as follows:

(a) Connect the VTVM and observe the readings as follows, with an output level of 500-uv:

a.	Pin 6 of V-703b:	12.0v rms
b.	Pin 1 of V-703a:	1.2v rms
c.	Pin 2 of V-703a:	0.12v rms
d.	Pin 1 of V-702:	12,000-uv
e.	Pin 1 of V-701:	1,200-uv

NOTE

The measurements should be made in the order listed, i.e. from the output stage back towards the input stage. When a reading is obtained it indicates that the preceding stages are operating correctly, and that the trouble is in the succeeding stage. For convenience the stage gain measurements are tabulated in table 8.

TABLE 8

STAGE GAIN CHART

TUBE OR COMPONENT	DESCRIPTION	VOLTAGE INPUT	VOLTAGE OUTPUT	STAGE GAIN	REMARKS
T-701	Input tuned circuit	500-uv	1200-uv	2.5	Input signal modulated 30% at 3000 cps
V-701	R-F Amplifier	1200-uv	12000-uv	10.0	
V-702	R-F Amplifier	12000-uv	120000-uv	10.0	HI-LO switch in HI position.
V-703a	Det/Audio Amp	120000-uv	1.2v	10.0	Output audio frequency.
V-703b	Audio Amplifier	1.2v	12.0v	10.0	
T-707	Output Trans.	12.0v	1.5v		
R-715	Audio Gain Pot.	1.5v	0.7v		Adjusted for 1 mw into 500 ohms.
R-728	Light Gain Pot.	1.5v	1.0v		Adjusted for threshold lamp operation.
FL-701	Tuned-Filter	0.35v	0.25v		Actuated Channel.
FL-701	Tuned-Filter	0.35v	0.07v		Non-active channels.
Q-704, Q-701	Lamp Amplifier	0.25-vdc	6.7-vdc		Lamp ON.

MODEL 5608 MARKER BEACON RECEIVER

MAINTENANCE PRACTICES

DISASSEMBLY

1. Job/Use

Disassembly of the Marker Beacon receiver is required only to perform those procedures concerned with cleaning, inspection, testing, trouble-shooting, and replacement of parts.

2. Procedure (See Figure 1 Section 34-8-4.)

DETAIL STEPS/WORK ITEMS	KEY ITEMS
A. Remove receiver from shockmount.	
(1) Loosen captive screw (5) on front of unit, that secures receiver to the shockmount.	
(2) Withdraw receiver from shockmount.	
B. Remove perforated cover (1) from receiver.	
(1) Release the two Dzus fasteners (2) on front of unit, that secure perforated cover to the receiver chassis frame (3).	
(2) Withdraw chassis frame from perforated cover.	

NOTE

All parts are readily accessible when perforated cover is removed. No further disassembly is is required.

CAUTION

WHEN REPLACING A TRANSISTOR, A CRYSTAL RECTIFIER, OR A THERMISTOR, AVOID OVER-HEATING THE PART.

INSPECTION

1. Job/Use

This procedure is used to determine, by visual inspection, that the components of the marker beacon receiver are in proper operating condition.

2. Procedure

DETAIL STEPS/WORK ITEMS	KEY ITEMS
A. Inspect etched circuit board for evidence of copper ribbon lifting away from board.	
B. Examine connector receptacle for bent or broken contact pins.	
C. Inspect all resistors and capacitors for discoloration or blistering.	
D. Check security of mounting of all parts.	
E. Check tubes on tube-tester. Emission and Mutual Conductance should be above the minimum specified.	
F. Check Beta of transistors in transistor checker.	
G. Check bulbs in Indicator Lamps for continuity.	Use PRESS-TO-TEST button for this purpose if equipment installed or connected to primary power.
H. Check ground connection of HI-LO sensitivity switch.	
I. Check teflon insulated sleeving on mounting screws of three 2N268 power transistors.	

ADJUSTMENT AND TEST

1. Test Specifications

Refer to table 1.

2. Tests

A. Job/Use

The following test procedures are used to determine whether the marker beacon receiver is in proper operating condition. If the receiver fails to meet satisfactorily the performance requirements, use either the alignment procedures outlined in this section to align the receiver, or the troubleshooting procedures in section 34-8-2 to isolate the trouble.

B. Test Equipment Required.

The following test equipment is required to perform test procedures on the marker beacon receiver.

(1) Hewlett Packard R-F Signal Generator, Model 608D or equivalent.

(2) Hewlett Packard Audio Oscillator, Model 200CD or equivalent.

(3) Hewlett Packard VTVM Model 801 or equivalent.

(4) Kaylab D-C Microvolt-Ammeter, Model 203 or equivalent.

(5) General Radio Output Meter, Model 583-A or equivalent.

(6) Opad-Green GPA 2810 Power Supply or equivalent.

(7) Dressen-Barnes Power Supply (B+), Model 3-150B or equivalent.

(8) Interconnecting cable. Must be fabricated (See figure 2, section 34-8-1).

C. Test Procedures

(1) Minimum Performance Tests.

The following minimum performance test procedures require the equipment set-up shown in figure 1, section 34-8-2.

TABLE 1

TEST SPECIFICATIONS

Type of Operation	TRF receiver for amplitude-modulated marker beacon transmissions. Provides aural and visual outputs.
Frequency Data	75-Mc. Fixed-tuned single-channel.
Power Requirements	Model 5608A: 13.75v 0.35 amp, and 125v @ 20-ma. or 27.5v 0.175-amp, and 125v @ 20-ma. Model 5608B: 13.75v 1-amp. Model 5608C: 27.5v 0.5-amp.
R-F Sensitivity	Adjustable over a range of 1000 to 15,000-uv for a reference level of 1-mw output into 500-ohms, and a threshold lamp voltage of 6-vdc.
R-F Selectivity	Bandpass is not less than 20-kc at 6-db Bandpass is not more than 3.5-mc at 60-db
Audio Level Characteristic	Audio output varies less than 10-db when input signal is increased from 1000 to 200,000-uv at modulation frequencies of 400, 1300, and 3000-cps.
Audio Distortion	Does not exceed 10% (distortion plus noise) for output of 1-mw into 500-ohms.
Lamp Frequency Response	Greatest change in input level to operate lamps over frequency range of 400 $\pm$ 20-cps, 1300 $\pm$ 65-cps, and 3000 $\pm$ 150-cps is 9-db.
Lamp Operate Selectivity	With 200,000-uv input modulated 30% at the operating frequency for each lamp, no measurable voltage is delivered to the circuits of the other lamps.
Receiver Input Impedance	50-ohms

(a) Perform R-F Sensitivity Test

1. Make job set-up.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
a. Connect equipment as shown in figure 11, Section 34-8-2.)	
b. Close Power ON-OFF switch to ON position.	
c. Throw HI-LO switch to HI position.	
d. Check indicator lamp bulbs by depressing lamp PRESS-TO-TEST buttons.	
e. Adjust receiver audio gain control R-715 fully clockwise for maximum sensitivity.	
f. Adjust receiver light gain control R-729 fully clockwise for maximum sensitivity.	
g. Tune R-F generator to 75-mc plus or minus 0.01 per cent.	

2. Perform Test

a. Adjust audio oscillator for modulation frequency of 1300-cps.

b. Adjust MOD PER CENT control on r-f generator to 30 per cent.

c. Increase voltage output of r-f generator until output meter reads 1-mw into 500-ohms.

d. The r-f generator output voltage shall be less than 1000-uv.

e. Repeat steps a. and b. at modulation frequencies of 400 and 3000-cps.

f. The results shall be the same as in step c.

(b) Perform R-F Sensitivity Test with HI-LO switch in LO position.

1. Make same job set-up as in previous test, except throw HI-LO switch to LO position.

2. Perform Test

a. Repeat steps a. through f. of previous procedure.

b. The r-f generator output voltage shall be between 2500 and 3500-uv.

c. If the sensitivity is otherwise, adjust LO-sensitivity gain control R-708 until correct sensitivity is obtained.

(c) Perform Selectivity Test.

1. Make job-set up.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
a. Make same job set-up as in previous test, except throw HI-LO switch to HI position.	

2. Perform Test

a. Adjust audio oscillator to 1300-cps.

b. Adjust r-f generator to 200-uv modulated 30 per cent.

c. Record reading on output meter.

d. Adjust r-f generator frequency to 75.03-mc.

e. Increase voltage output of r-f generator to obtain same reading on output meter as in step c.

f. The increase in r-f generator output voltage shall not be greater than 6-db.

g. Adjust r-f generator frequency to 74.95-mc.

h. Increase voltage output of r-f generator to obtain same reading on output meter as in step c.

i. The increase in r-f generator voltage shall not be greater than 6-db.

j. Adjust r-f generator frequency to 78.5-mc.

k. Increase signal generator output to obtain same output meter reading as in step c.

l. The increase in r-f generator voltage shall not be less than 60-db.

m. Adjust r-f generator frequency to 71.5-mc.

n. Increase r-f generator output voltage to obtain same output meter reading as in step c.

o. The increase in r-f generator output voltage shall not be less than 60-db.

(d) Perform Lamp Operation Selectivity Test.

1. Make Job Set-up.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
a. Make same job setup as for r-f sensitivity test.	

2. Perform Test

a. Adjust frequency of audio oscillator to 1300-cps.	
b. Adjust voltage output of r-f generator to 200,000-uv modulated 30%.	
c. Measure d-c voltage across the 1300-cps indicator lamp with VTVM. The reading should be approximately 6-vdc.	
d. Measure d-c voltage across the 400 and 3000-cps indicator lamps. The measured voltages shall not exceed 1.8-vdc.	

NOTE

If the VTVM readings obtained in steps c. and d. do not correspond to those indicated, reference should be made to the Audio and Light Control Adjustments under Alignment Procedures.

(e) Perform Audio Frequency Response Test

1. Make Job Set-up

DETAIL STEPS/WORK ITEMS	KEY ITEMS

a. Make same job set-up as for r-f sensitivity test.

2. Perform Test

a. Adjust audio oscillator to 1300-cps.

b. Adjust voltage output of r-f generator to 10,000-uv modulated 30 per cent.

c. Record reading on output meter.

d. Vary frequency of audio oscillator from 1235 to 1365-cps and record readings on output meter.

e. The total variation in audio output (from minimum reading to maximum reading) shall not exceed 9-db.

f. Adjust audio oscillator to 400 cps, and record reading on output meter.

g. Vary frequency of audio oscillator from 380 to 420-cps, and record readings on output meter.

h. The results shall be the same as in step e.

i. Adjust audio oscillator to 3000-cps, and record reading on output meter.

j. Vary frequency of audio oscillator from 2850 to 3150-cps and observe output meter.

k. The results shall be the same as in step e.

(f) Perform Signal-plus-Noise/Noise Ratio Test

1. Make Job Set-up

DETAILS STEPS/WORK ITEMS	KEY ITEMS
a. Make same job set-up as for r-f sensitivity test.	

2. Perform Test

a. Adjust audio oscillator to 1300-cps.	
b. Adjust voltage output of r-f generator to 1000-uv modulated 30 per cent.	
c. Record reading on output meter.	
d. Switch OFF modulation on r-f generator, and record reading on output meter.	
e. The power output shall be down at least 20-db from the reading observed in step c.	
f. Increase voltage output of signal generator to 200,000-uv, modulated 30 per cent.	
g. Record reading on output meter.	
h. Switch off modulation on r-f generator, and record reading on output meter.	
i. The power output shall be down at least 20-db from the reading observed in step g.	

(g) Perfrom A.V.C. Characteristic Test

1. Make job set-up.

DETAIL STEPS/WORK ITEMS	KEY ITEMS
a. Make same job set-up as for r-f sensitivity test.	
b. Connect d-c VTVM between junction of R-705 and R-709 and ground. Set VTVM for negative d-c reading.	

2. Perform Test.

a. Adjust aduio oscillator to 1300-cps.	
b. Adjust voltage output of r-f generator to 500, 1000, 5000, and 10,000-uv in succession, and record reading on VTVM for each level.	
c. Voltage readings should be as indicated in Table 2.	
d. Increase voltage output of signal generator to 200,000-uv, and observe output meter.	
e. The increase in power output between 1000-uv input and 200,000-uv input shall not be greater than 10-db as read on the output meter.	

(2) Alignment Procedures and Adjustments.

(a) Align Receiver

1. Make Job Set-up

TABLE 2

R-F Input	D-C Grid Volts V-701	D-C Grid Volts V-702	D-C Grid Volts V-703a	D-C Grid Volts V-703b
0.0 uv	-0.43V	-0.43V	-0.86V	-0.43V
500.0 uv	-0.6	-0.6	-1.2	-0.6
1000.0 uv	-1.45	-1.45	-2.9	-1.6
5000.0 uv	-3.4	-3.4	-6.8	-3.8
10000.0 uv	-3.85	-3.85	-7.7	-4.1

DETAIL STEPS/WORK ITEMS KEY ITEMS

a. Connect equipment as shown in figure 11.

b. Adjust receiver audio gain control, R-715, for maximum sensitivity. (Fully clockwise.)

c. Adjust receiver light gain control, R-728, for maximum sensitivity. (Fully clockwise.)

d. Throw HI-LO switch to HI position.

e. Throw power ON-OFF switch to ON position.

f. Primary d-c voltage and B/ voltage must be within the following tolerances:

For 14-vdc operation: 13.75-vdc $\pm$ 2%

For 28-vdc operation: 27.5-vdc $\pm$ 2%

B/ voltage: 125-vdc $\pm$ 2%.

g. Adjust General Radio output meter for 500-ohm load.

2. Perform Alignment

a. Adjust the audio osciallator to 1300-cps.

b. Adjust the r-f generator to 75-mc ± 0.01% modulated 30%.

c. Increase the voltage output of the r-f generator until the output meter indicates a reading.

NOTE

It may be necessary to use full signal generator output voltage to obtain an initial reading on the output meter. If an output cannot be obtained under these conditions, short out any stage by jumpering from grid to grid, and adjust the tuning coils of the remaining stages until an output is observed. Then remove the jumper.

d. Adjust in the following order, the coils of tuned-circuits T-701, T-702, T-703, T-704, T-705, and T-706 for a maximum reading on the output meter. Reduce the output of the signal generator after each adjustment so that the reading on the output meter does not exceed 1-mw. Repeat the coil adjustments at least three times.

e. Solder the tuning coil adjustments and sealer holes to provide an hermetic seal and lock the adjustments.

(b) Audio and Light Control Adjustments

1. Make job set-up

DETAIL STEPS/WORK ITEMS	KEY ITEMS
a. Make same job set-up for r-f sensitivity test.	
b. Connect D-C VTVM across the 1300-cps indicator lamp.	

2. Perform Adjustments

a. Adjust audio oscillator to 1300-cps.	
b. Adjust r-f generator output voltage to 1000-uv, modulated 30%.	
c. Adjust audio gain control R-715 until output meter reads 1-mw.	
d. Adjust light gain control R-728 until VTVM reads 6-vdc.	
e. Re-adjust R-715 and R-728 as often as necessary until readings are steady.	

REPAIR

1. Job/Use

Repair of the marker beacon receiver is limited to the replacement of all defective parts and the repair of the copper ribbon wiring of the etched circuit board.

2. Procedure

A. Component Removal

DETAIL STEPS/WORK ITEMS	KEY ITEMS
(1) Cut the lead of the component to be removed as close as possible to the body of the component.	
(2) Use a small soldering iron to apply heat to the etched circuit side of the board where the cut lead of the component protrudes through the board.	Use soldering iron no greater than 35-watts.
(3) As the solder on the etched circuit side of the board melts, gently push the component lead through the hole from the component side of the board.	
(4) When the crimp in the component lead is free of the etched circuit, remove the soldering iron and cut-off the lead close to the hole.	
(5) Next apply heat to the portion of the lead remaining in the hole, and pull the wire through the hole from the component side of the board.	Pulling the wire from the component side of the board prevents the copper ribbon from being lifted off the board.
(6) Clean the solder and burrs from the hole. Use an awl if necessary, taking care to clean the hole from the etched side to prevent lifting the copper ribbon	

B. Component Replacement

(1) Bend the leads of the component to be mounted on the eteched circuit board so that they pass easily through the mounting holes.

Forcing a lead through a mounting hole may lift the copper ribbon from the board.

(2) Solder the component leads to the board on the etched circuit side by applying heat with a small soldering iron; solder will flow from the lead to the etched circuit board and adhere to the copper ribbon.

Care must be exercised that the copper ribbon is not overheated.

(3) Clip off the excess lead close to the copper ribbon.

(4) Use a small brush dipped in alcohol to remove excess solder flux around the lead and immediate area.

(5) Bursh or spray a light film of clear lacquer over the new joint and the surrounding area.

(6) If one of the component leads continues to another terminal follow the preceding steps but do not clip the lead. Just form the lead to reach the next terminal and solder as required.

C. Repairing the Copper Ribbon

(1) Pull the loose or broken copper ribbon back so that, when cut, the remaining portions are firmly stuck to the etched circuit board on either side of the break.

(2) Cut the loose ribbon from the etched circuit board and tin the ends still adhering to the board for about 1/4 inch from each end.

(3) Place a piece of 24-gauge tinned copper wire over the gap on the circuit board so that at least 1/4 inch of each end overlaps the 1/4 inch sections of tinned copper ribbon.

(4) Solder each end of the wire to the copper ribbon.

(5) Remove excess flux with small brush dipped alcohol.

(6) Brush or spray a light film of lacquer over the new joint and surrounding area.

D. Repairing Thermal-Sensitive Components

(1) Firmly grip the lead being soldered with pair of pliers between the soldering iron and the body of the thermal-sensitive component.

The pliers function as a heat-sink to conduct the heat of the soldering iron away from the transistor or diode etec.

CLEANING

1. Job/Use

This procedure is the minimum necessary to clean the marker beacon receiver.

2. Procedure

DETAIL STEPS/WORK ITEMS	KEY ITEMS
A. Remove dust from receiver assembly with a low pressure air hose and/or soft brush.	Air pressure - 20 psi maximum.
B. Remove excess solder flux with a soft brush dipped in alcohol.	

ASSEMBLY AND INSTALLATION

1. Job/Use

Assembly and installation of the marker beacon receiver is required after completion of those procedures concerned with cleaning, inspection, testing, troubleshooting, and replacement of parts.

2. Procedure

DETAIL STEPS/WORK ITEMS	KEY ITEMS
A. Replace receiver in perforated cover.	
(1) Replace chassis frame inside perforated cover.	
(2) Secure the two Dzus fasteners on the front of the receiver.	
B. Replace assembled receiver in shockmount.	
(1) Insert the extended portion of the receiver etched circuit board into the shockmount cannon connector receptacle.	
(2) Secure the assembled receiver to the shockmount by means of the captive screw on the front of the receiver.	

CAUTION

WHEN INSERTING THE RECEIVER CONNECTOR BOARD INTO THE SHOCKMOUNT CANNON CONNECTOR, CARE SHOULD BE TAKEN TO AVOID BENDING THE CANNON CONNECTOR CONTACT TAILS.

STORAGE INSTRUCTIONS

1. Job/Use

This procedure is used if it becomes necessary to store the marker beacon receiver.

2. Procedure

DETAIL STEPS/WORK ITEMS	KEY ITEMS
A. Thoroughly clean the entire unit.	
B. Place a 4 x 1 x 1/2 inch chipboard box over the connector extension board at the base-rear of the unit.	Secure box with masking tape.
C. Cushion the bottom of an 8 x 6 x 4 inch corrugated carton with shredded tissue.	
D. Place the unit in the center of the carton and surround it with shredded tissue.	
E. Cover the unit with shredded tissue.	
F. Close and tape the carton.	
G. Mark the carton to indicate the contents.	

SPECIAL TOOLS, FIXTURES, AND EQUIPMENT LIST

(No special tools or fixtures are required for performing test procedures on the marker beacon receiver. Refer to paragraph 2B for a list of standard equipment required.)

FITS AND CLEARANCES

(This subject does not apply to parts in the marker beacon receiver.)

MODEL 5608 MARKER BEACON RECEIVER

ILLUSTRATED PARTS BREAKDOWN AND PARTS LISTS

1. Introduction

A. The Illustrated Parts Breakdown lists, describes and illustrates the main parts of the Marker Beacon Receiver.

B. The Component Identification Illustration shows the physical location of the capacitors, resistors, tubes, filter, coils, diodes, and transformers on the Marker Beacon Receiver.

C. The Component Identification Illustration Parts List gives the Lear part number for each item.

D. The Indicator Light Kit Parts List gives the Lear part numbers and the required number of each item for each kit.

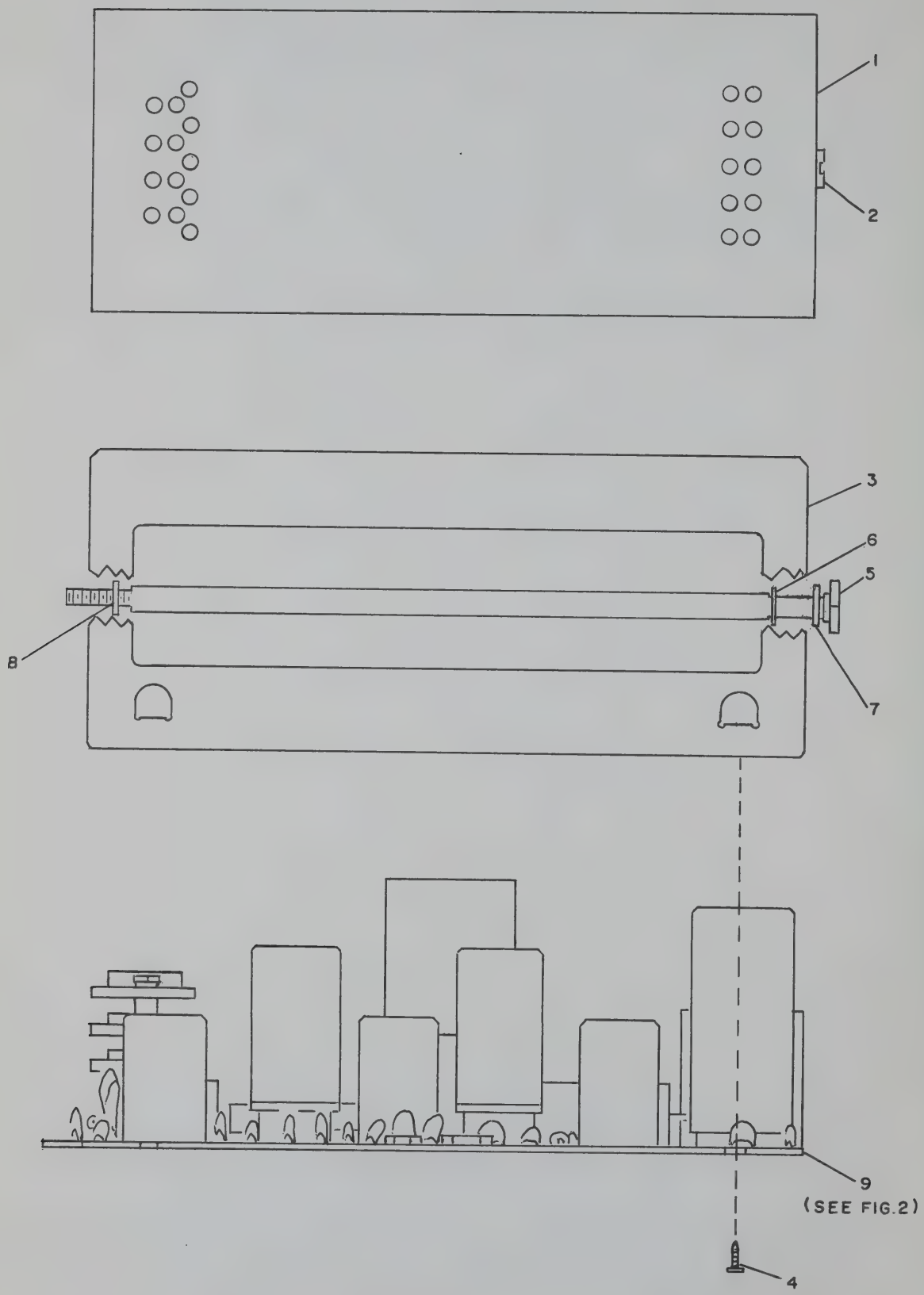


Figure 1
Disassembly View

STOCK NUMBER		DESCRIPTION	USAGE CODE	UNITS PER ASSY
ITEM NO.	PART NUMBER	1 2 3 4 5 6 7		
	712336-01	RECEIVER, Marker Beacon Model 5608A	A	1
	712336-02	RECEIVER, Marker Beacon Model 5608B	B	
	712336-03	RECEIVER, Marker Beacon Model 5608C	C	
-1	712542	. COVER		1
		(ATTACHING PARTS)		
-2		. DZUS FASTENER		2
		----*----		
-3	712578	. CHASSIS		1
		(ATTACHING PARTS)		
-4	43700-SC4B6	. SCREW, Self Tapping		5
		----*----		
-5	712545	. SCREW, Captive		1
-6	S36001-10	. RING, Retaining		1
-7	AN960-PD10	. WASHER, Flat		1
-8	96510-51	. WASHER, Flat		1
-9	712563	. BOARD ASSEMBLY (See Figure 2)		1
	712927-01	. POWER SUPPLY ASSEMBLY (Model 2354A, 14v)	B	1
	712927-02	. POWER SUPPLY ASSEMBLY (Model 2354B, 28v)	C	
		(ATTACHING PARTS)		
		. SCREW, Machine no. 4 x 1/4	B & C	4
		----*----		

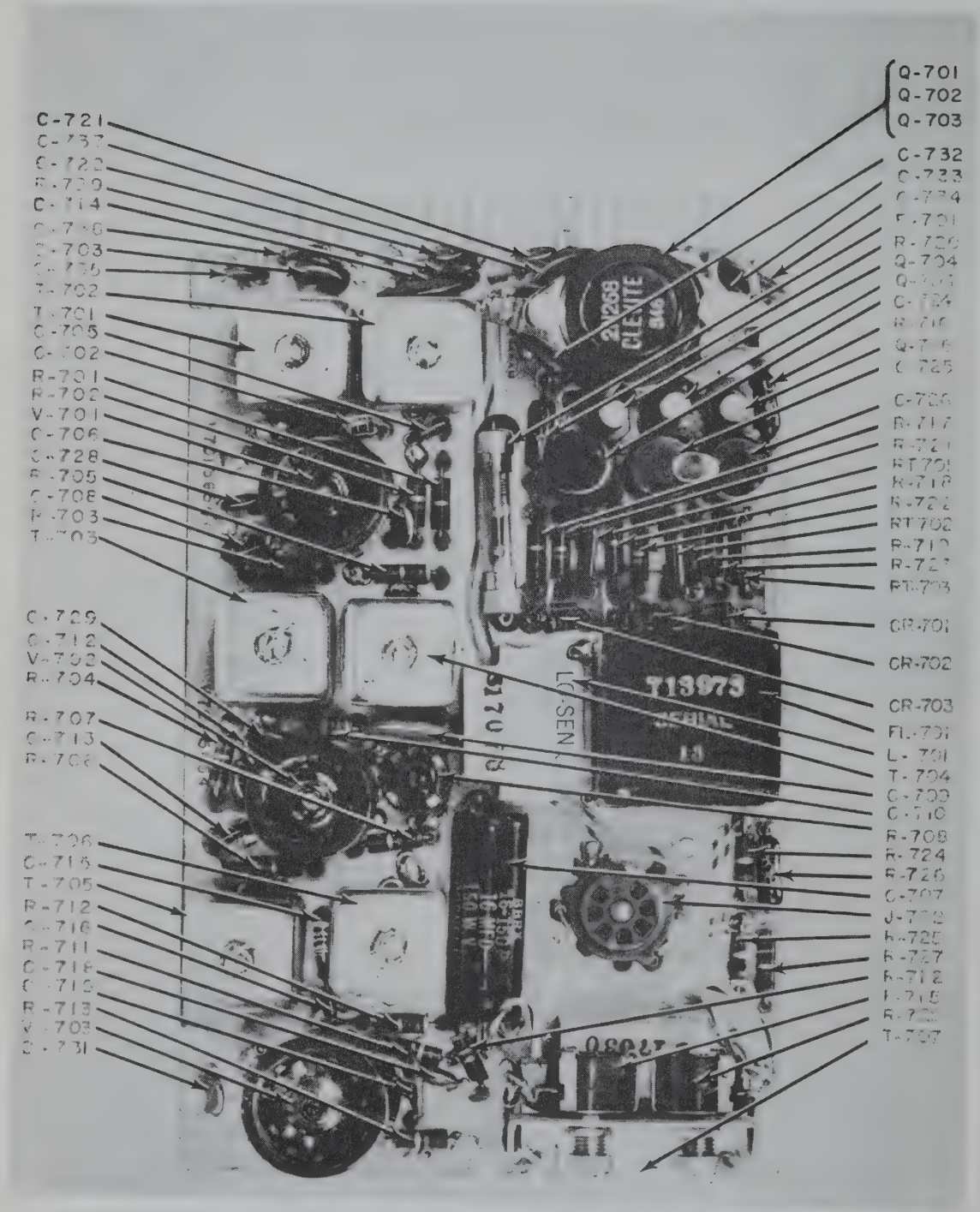


Figure 2
Component Identification Illustration

Symbol Number	Lear Part Number	Description	Units per Assy
C701	705148-050-DG	Capacitor, Fixed, Mica Dielectric; 5-uuf ± 2%, 500 wvdc	1
C702	703907-15-05	Capacitor, Fixed, Composition; 5-uuf ± 2%, 500 wvdc	3
C703	705148-251-DK	Capacitor, Fixed, Mica Dielectric; 250-uuf ± 10%, 500 wvdc	1
C704	S10006L-1000H	Capacitor, Fixed, Ceramic Dielectric; 0.001-uf ± 20%, 500 wvdc	18
C705	----	Same as C704	-
C706	----	Same as C704	-
C707	S10028-16-150X	Capacitor, Fixed, Electrolytic; 16-uf, 150 wvdc	1
C708	----	Same as C704	-
C709	90732-17	Capacitor, Fixed, Ceramic Dielectric; 0.05-uf + 30% -20%, 500 wvdc	1
C710	----	Same as C702	-
C711	----	Same as C704	-
C712	----	Same as C704	-
C713	----	Same as C704	-
C714	63506-04	Capacitor, Fixed, Ceramic Dielectric; 0.01-uf +80% -20%, 450 wvdc	5
C715	----	Same as C702	-
C716	S10006-L470H	Capacitor, Fixed, Ceramic Dielectric; 470-uuf ± 20%, 500 wvdc	1
C717	----	Not used	-
C718	S10006-K150G	Capacitor, Fixed, Ceramic Dielectric 150-uuf ± 10%, 500 wvdc	1
C719	90732-06	Capacitor, Fixed, Ceramic Dielectric; 0.005-uf min value, 500 wvdc	1
C720	----	Same as C704	-
C721	----	Same as C704	-
C722	----	Same as C704	-
C723	----	Same as C704	-
C724	S10012-03	Capacitor, Fixed, Electrolytic; 50-uf +150% -10%, 30 wvdc	3
C725	----	Same as C724	-
C726	----	Same as C724	-
C727	----	Same as C704	-
C728	----	Same as C704	-
C729	----	Same as C704	-
C730	----	Same as C704	-
C731	----	Same as C704	-
C732	----	Same as C714	-

Symbol Number	Lear Part Number	Description	Units per Assy
C733	----	Same as C714	-
C734	----	Same as C714	-
C735	----	Same as C704	-
C736	----	Same as C704	-
C737	----	Same as C714	-
CR701	S12002-013	Diode, Clevite CTP-470-GE-SI	3
CR702	----	Same as CR701	-
CR703	----	Same as CR701	-
E701	S23002-01	Shield, Tube, 7 pin	2
E702	----	Same as E701	-
E703	S23003-02	Shield, Tube, 9 pin	1
F701	S21000-05	Fuse, 15/100A	1
FL701	713973	Filter Assembly, 400-1300-3000 cps	1
L701	S17078	Choke, 2H, 30 ma, 250 ohms	1
Q701	S12001-015	Transistor, 2N268	3
Q702	----	Same as Q701	-
Q703	----	Same as Q701	-
Q704	S12001-005	Transistor 2N139	3
Q705	----	Same as Q704	-
Q706	----	Same as Q704	-
R701	S11012-225-K	Resistor, Fixed, Composition; 2.2-megohms ± 10%, 1/2-w	1
R702	S11012-221-K	Resistor, Fixed, Composition; 220-ohms, 1/2-w	3
R703	S11012-100-K	Resistor, Fixed, Composition; 10-ohms ± 10%, 1/2-w	2
R704	S11012-102-K	Resistor, Fixed, Composition; 1K-ohms, 1/2-w	1
R705	S11012-475-K	Resistor, Fixed, Composition; 4.7-megohms, 1/2-w	2
R706	----	Same as R703	-
R707	----	Same as R702	-
R708	S11024-103UM	Resistor, Variable, Composition; 10K-ohms, 1/4-w	1
R709	----	Same as R705	-
R710	----	Not Used	-

Symbol Number	Lear Part Number	Description	Units Per Assy
R711	S11012-274-K	Resistor, Fixed, Composition; 270 K-ohms ± 10%, 1/2-w	1
R712	S11012-474-K	Resistor, Fixed, Composition; 0.47-megohms ± 10%, 1/2-w	1
R713	---	Same as R702	-
R714	S11012-331-K	Resistor, Fixed, Composition; 330-ohms ± 10%, 1/2-w	1
R715	S11016-T102L	Resistor, Variable, Composition; 1 K-ohms, 1/2-w	1
R716	707732-11	Resistor, Fixed, Wire wound; 18-ohms ± 10%, 3-w	1
R717	S11012-272-K	Resistor, Fixed, Composition; 2.7 K-ohms ± 10%, 1/2-w	4
R718	----	Same as R717	-
R719	----	Same as R717	-
R720	707732-10	Resistor, Fixed, Wire wound; 1-ohms ± 10%, 3-w	1
R721	S11012-563-K	Resistor, Fixed, Composition; 56 K-ohms ± 10%, 1/2 w	3
R722	----	Same as R721	-
R723	----	Same as R721	-
R724	S11012-470-K	Resistor, Fixed, Composition; 47-ohms ± 10%, 1/2-w	2
R725	----	Same as R724	-
R726	707732-12	Resistor, Fixed, Wire wound; 1 K-ohms ± 5%, 3-w	1
R727	----	Same as R717	-
R728	S11016-T103L	Resistor, Variable, Composition; 10 K-ohms, 1/4-w	1
R729	707732-03	Resistor, Fixed, Wire wound; 33-ohms ± 5%, 3-w	1
RT701	S11015-F-272-K-07	Resistor, Thermal, Composition; 2.7-K ohms ± 10%	3
RT702	----	Same as RT701	-
RT703	----	Same as RT701	-
T701	712884	Coil Assembly, Shielded	6
T702	----	Same as T701	-
T703	----	Same as T701	-
T704	----	Same as T701	-
T705	----	Same as T701	-
T706	----	Same as T701	-
T707	S17030	Transformer, Output	1

Symbol Number	Lear Part Number	Description	Units Per Assy
V701	S12000-017	Tube, Electron, 5654	2
V702	----	Same as V701	-
V703	S12000-021	Tube, Electron, 6072	1
X700	S23006-7BMP	Socket, Tube, 7 pin	1
XQ700 to XQ703		Not used	
XQ704	S23001-02	Socket, Transistor, 3 pin	3
XQ705	----	Same as XQ704	-
XQ706	----	Same as XQ704	-
XV701	S23008-703	Socket, Tube, 7 pin	2
XV702	----	Same as XV701	-
XV703	S23008-903	Socket, Tube, 9 pin	1

INDICATOR LIGHT KIT PARTS LIST

Lear Part Number	Description	Units Per Assembly			
		A	B	C	D
S21008-A-DO4	Light Assembly, Amber	2	2	1	1
S21008-A-DO5	Light Assembly, Blue	2	2	1	1
S21008-A-DO1	Light Assembly, White	2	2	1	1
S21008-330	Lamp, Indicator (14v, G.E. 330)	6	6	3	3
707732-07	Resistor, 120-ohms, 3-w			3	3
707732-14	Resistor, 68-ohms, 3-w		3		3
62560	Switch, SPST	1	1	1	1
96173-01	HI-LO Sense Plate	1	1	1	1

A - Supplied in 714204-201 Kit only (14v with 2 sets of bulbs)

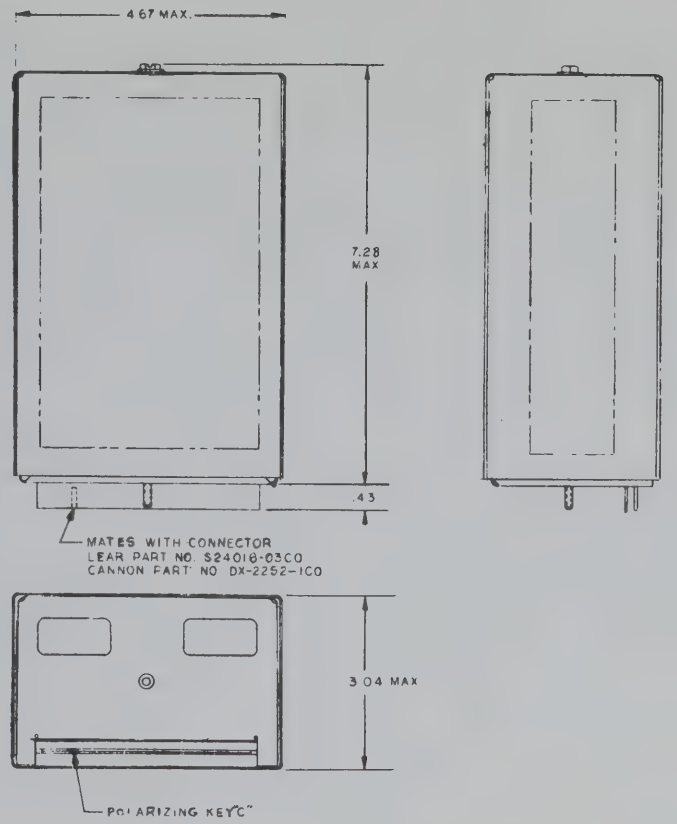
B - Supplied in 714204-202 Kit only (28v with 2 sets of bulbs)

C - Supplied in 714204-101 Kit only (14v with 1 set of bulbs)

D - Supplied in 714204-102 Kit only (28v with 1 set of bulbs)

APPENDIX J

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	RELEASED	9/14	



5608-1
A

NOTES.
1. DIMENSIONS SHOWN ARE FOR INSTALLATION PURPOSES ONLY.
2. FINAL ASSEMBLY NO. 712336
3 SCHEMATIC DIAGRAM NO712337

NEXT ASSY	USED ON
APPLICATION	

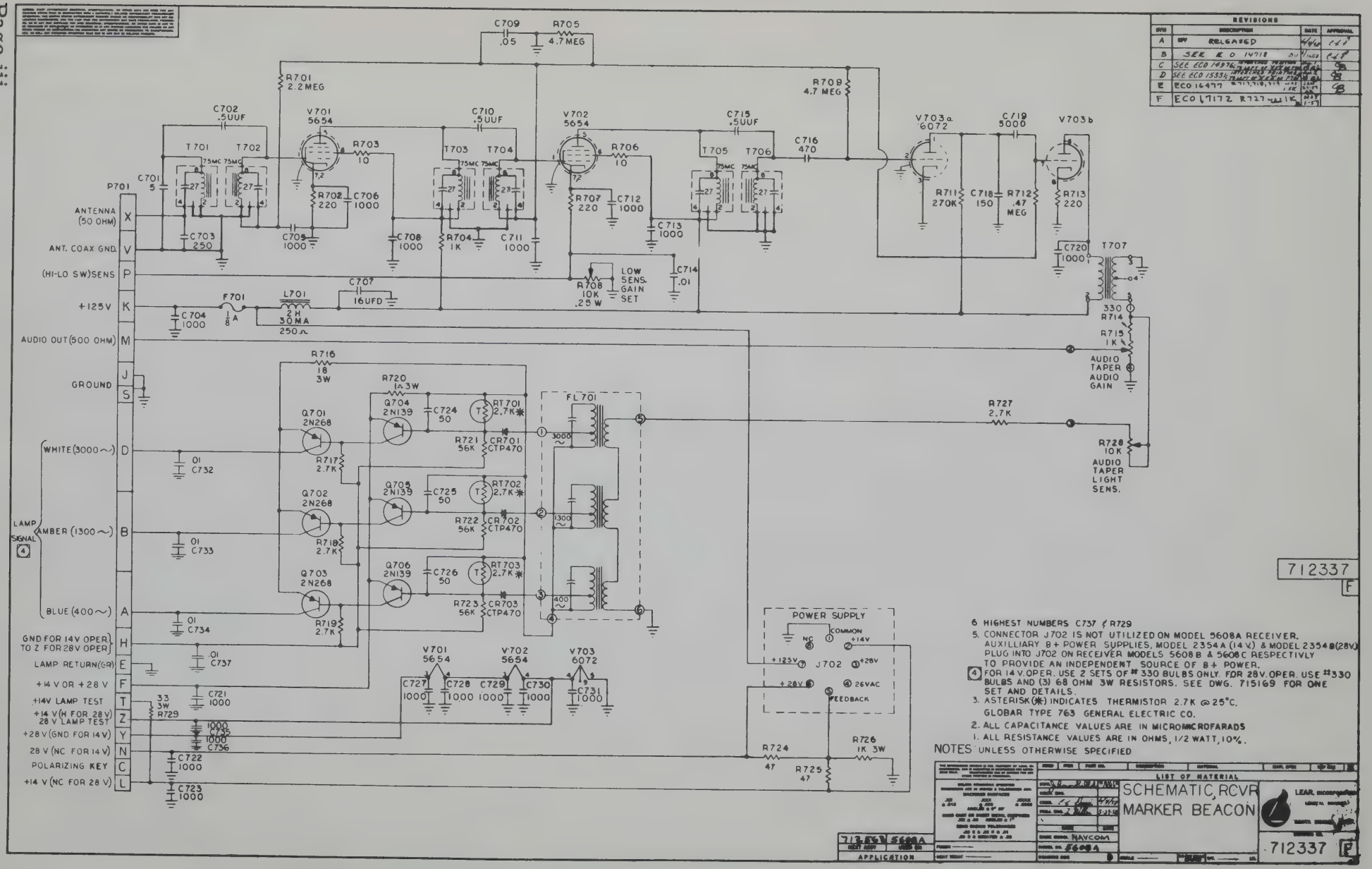
LIST OF MATERIAL

INSTALLATION DATA
MODEL 5608 A,B,C
75MC MARKER BEACON
RECEIVER

BASIC MODEL 5608
DRWG. NO. 5608 A,B,C
SCALE 1/1 WT. 2.0 LBS.

LEAR SIEGLER, INC. ELECTRONIC EQUIPMENT DIV. SANTA MONICA, CALIF.

5608-1 A


REVISIONS
A RELEASED
B SEE E O 14718
C SEE ECO 14976
D SEE ECO 15331
E ECO 16477
F ECO 17172 R727 2.7K
P701
ANTENNA (50 OHM) X
ANT. COAX GND. V
(HI-LO SW)SENS P
+125V K
AUDIO OUT(500 OHM) M
GROUND J S
WHITE(3000~) D
LAMP SIGNAL 4
AMBER (1300~) B
BLUE (400~) A
GND FOR 14V OPER TO Z FOR 28V OPER H
LAMP RETURN(GR) E
+14 V OR +28 V F
+14V LAMP TEST T
+14 V(H FOR 28 V) 28 V LAMP TEST Z
+28 V(GND FOR 14 V) Y
28 V (NC FOR 14 V) N
POLARIZING KEY C
+14 V (NC FOR 28 V) L
V701 5654
V702 5654
V703a 6072
V703b
V701 5654
V702 5654
V703 6072
Q701 2N268
Q702 2N268
Q703 2N268
Q704 2N139
Q705 2N139
Q706 2N139
FL701
POWER SUPPLY
COMMON +14V
+123V J702 +28V
+28V 26VAC
FEEDBACK
AUDIO TAPER AUDIO GAIN
AUDIO TAPER LIGHT SENS.
LOW SENS. GAIN SET
712337 F
6 HIGHEST NUMBERS C737 & R729
5. CONNECTOR J702 IS NOT UTILIZED ON MODEL 5608A RECEIVER. AUXILLIARY B+ POWER SUPPLIES, MODEL 2354A (14 V.) & MODEL 2354B(28V) PLUG INTO J702 ON RECEIVER MODELS 5608B & 5608C RESPECTIVLY TO PROVIDE AN INDEPENDENT SOURCE OF B+ POWER.
4. FOR 14 V.OPER. USE 2 SETS OF #330 BULBS ONLY. FOR 28V.OPER. USE #330 BULBS AND (3) 68 OHM 3W RESISTORS. SEE DWG. 715169 FOR ONE SET AND DETAILS.
3. ASTERISK(*) INDICATES THERMISTOR 2.7K @ 25°C. GLOBAR TYPE 763 GENERAL ELECTRIC CO.
2. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, 10%.
NOTES: UNLESS OTHERWISE SPECIFIED
LIST OF MATERIAL
SCHEMATIC, RCVR MARKER BEACON
NAVCOM
5608A
712337 F
APPLICATION

REVISIONS

1. The purpose of the revision section is fourfold. It is intended to correct errors in the manual: to describe circuit improvements made upon the subject equipment since publication of the manual; to discuss maintenance problems that have arisen, and to provide the customer with information for expanding the usefulness and versatility of the equipment.

2. Revisions of the manual will be issued in loose-leaf form with perforated margins. As additional information, pertinent to the equipment, is published it may be inserted in this section. In this way, the customer may avoid loss of individual revision sheets, and accumulate a complete set of information for convenient reference.

REVISION NO. 1

MODEL 5608 MARKER BEACON RECEIVER

SUBJECT: Circuit changes and Parts List

1. DESCRIPTION

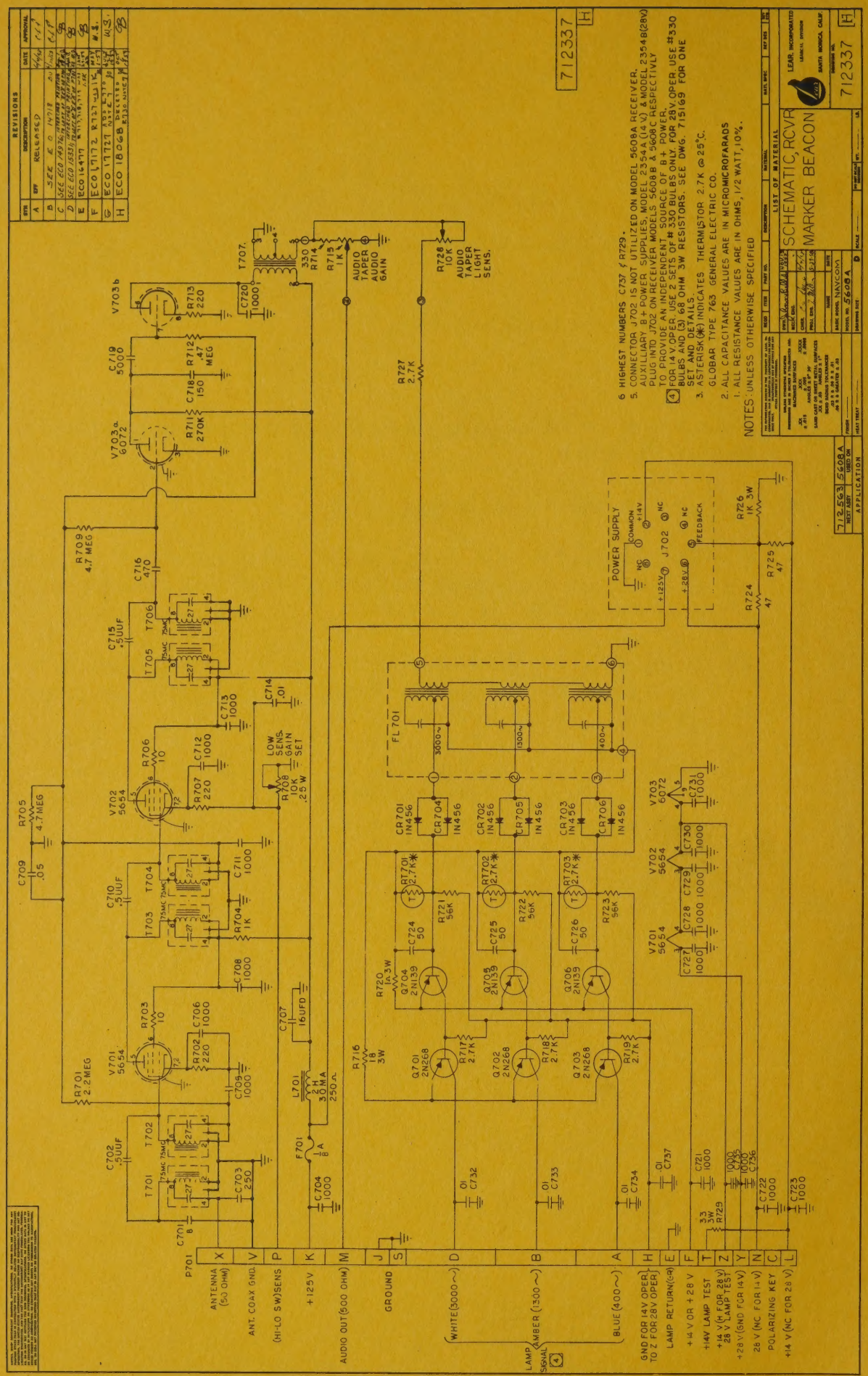
A. Figure 1301 is the revised schematic of the Model 5608 Marker Beacon Receiver.

B. Changes include the following:

(1) Diodes CR-701, CR-702, and CR-703 in the Lamp Amplifier are changed from Type CTP470 to Type IN456 and paralleled with diodes CR-704, CR-705, and CR-706 respectively.

(2) Items CR-701, CR-702, and CR-703, Part No. S12002-013, should be deleted from the Parts List on Page 6, Section 34-8-4.

(3) Items CR-701, CR-702, CR-703, CR-704, CR-705, and CR-706, Part No. S12002-024 should be added to the Parts List on Page 8, Section 34-8-4.


712337 H
SCHEMATIC, RCVR MARKER BEACON
LEAR, INCORPORATED
712337 H
712563 5608A
APPLICATION
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, 10%.
2. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
3. ASTERISK (*) INDICATES THERMISTOR 2.7K @ 25°C.
GLOBAR TYPE 763 GENERAL ELECTRIC CO.
4. FOR 14V USE 2 SETS OF #330 BULBS IN W. FOR 28V, OPER. USE #330 BULBS AND (3) 68 OHM 3W RESISTORS. SEE DWG. 715169 FOR ONE SET AND DETAILS.
5. CONNECTOR J702 IS NOT UTILIZED ON MODEL 5608A RECEIVER.
AUXILIARY B+ POWER SUPPLIES, MODEL 2354A (14 V.) & MODEL 23548 (28V.)
PLUG INTO J702 ON RECEIVER MODELS 5608B & 5608C RESPECTIVELY
TO PROVIDE ANTENNA SENSE.
6. HIGHEST NUMBERS C737 & R729.
REVISIONS
LTR DESCRIPTION RELEASED DATE APPROVAL
A SEE E.O. 14718
B SEE ECO 14976
C SEE ECO 15838
D ECO 16477
E ECO 16772
F ECO 17727
G ECO 18068
H ECO 18068
P701
ANTENNA (50 OHM)
ANT. COAX GND.
(HI-LO SW)SENS
+125V
AUDIO OUT (600 OHM)
GROUND
(WHITE (300~)
AMBER (1300~)
BLUE (400~)
LAMP SIGNAL
GND FOR 14V OPER. TO Z FOR 28V OPER.
LAMP RETURN (GND)
+14 V OR +28 V
+14V LAMP TEST
+14 V (+ FOR 28V) 28 V LAMP TEST
+28 V (GND FOR 14 V)
28 V (NC FOR 14 V)
POLARIZING KEY
+14 V (NC FOR 28 V)
POWER SUPPLY
J702
+14V
+125V
+28V
NC
FEEDBACK
COMMON
FL701
3000~
1300~
400~
V701 5654
V702 5654
V703 6072
V703a 6072
V703b
V704 5654
V705 5654
V706 6072
T701
T702
T703
T704
T705
T706
T707
Q701 2N268
Q702 2N268
Q703 2N268
Q704 2N139
Q705 2N139
Q706 2N139
CR701 IN456
CR702 IN456
CR703 IN456
CR704 IN456
CR705 IN456
CR706 IN456
F701 1A 8
L701 2H 30MA 250Ω
R701 2.2MEG
R702 220
R703 10
R704 1K
R705 4.7MEG
R706 10
R707 220
R708 10K .25W LOW SENS. GAIN SET
R709 4.7 MEG
R711 270K
R712 .47 MEG
R713 220
R714 330
R715 1K AUDIO TAPER AUDIO GAIN
R716 18 3W
R717 2.7K
R718 2.7K
R719 2.7K
R720 4.3K 3W
R721 56K
R722 56K
R723 56K
R724 47
R725 47
R726 1K 3W
R727 2.7K
R728 10K AUDIO TAPER LIGHT SENS.
R729 33 3W
C701 8
C702 .5UUF
C703 250
C704 1000
C705 1000
C706 1000
C707 16UFD
C708 1000
C709 .05
C710 .5UUF
C711 1000
C712 1000
C713 1000
C714 .01
C715 .5UUF
C716 470
C718 150
C719 5000
C720 1000
C721 1000
C722 1000
C723 1000
C724 50
C725 50
C726 50
C727 1000
C728 1000
C729 1000
C730 1000
C731 1000
C732 .01
C733 .01
C734 .01
C735 1000
C736 1000
C737 .01

LEAR, INC., LEARCAL DIVISION

3171 S. BUNDY DRIVE, SANTA MONICA, CALIFORNIA, U.S.A.